February
1931

AMERICAN GAS ASSOCIATION MONTHLY

AMERICAN GAS ASSOCIATION · LIGHT · HEAT · POWER · INCORPORATED · 1919

Advertising is Industry's Most Economic and Effective Salesman

▼

Even when aggressive sales effort may not be underway, it is necessary to keep the public's mind trained our way.

▼

Direct Mail Advertising

That is appropriate for specific sales campaigns or for interim mailing or hand-out should always be on hand.

▼

The A. G. A. Pieces

"Household Hints" and "Health, Happiness and Hot Water" are suitable for either of these purposes.

▼

If you haven't price quotations on this literature write for it.

▼

PUBLICITY AND ADVERTISING SECTION
AMERICAN GAS ASSOCIATION
420 Lexington Ave., New York City

AMERICAN GAS ASSOCIATION MONTHLY

Allyn B. Tunis, Editor

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OUR OWN WHO'S WHO

W. E. Steinwedell

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W. E. STEINWEDELL, president of the Gas Machinery Company, Cleveland, Ohio, was born in Quincy, Ill., on January 12, 1873. He graduated from the University of Illinois in 1893 in mechanical and electrical engineering and attended the University of Chicago in 1894, taking post-graduate work in gas and chemical engineering. In 1895, he accepted a position with the European Continental Gas Company, a syndicate operating, constructing and rebuilding plants in various parts of Europe, remaining there until 1898. From 1898 to 1902, Mr. Steinwedell operated gas and electric properties in Quincy and Belleville, Ill. He became identified with the Gas Machinery Company in 1902, and has been associated with that company ever since. Mr. Steinwedell has been active in the work of the American Gas Association since its organization and at present is serving as vice-chairman of the Manufacturers Section.

AMERICAN
GAS ASSOCIATION
MONTHLY

VOLUME XIII | FEBRUARY, 1931 | NUMBER 2

Association Establishes Gas Appliance Inspection Station on Pacific Coast

THE large increase in the number of manufacturers of approved gas appliances on the Pacific Coast within the last three years has necessitated the establishment of a preliminary testing and inspection station in that territory by the Executive Board of the American Gas Association on recommendation of the Managing Committee of the Testing Laboratory. On January 1, 1927, there were only nine manufacturers of approved gas appliances in the region west of the Rocky Mountains, among which were three manufacturers of ranges, two of water heaters, and four of central heating gas appliances. At present, more than 43 per cent of all manufacturers of approved central heating gas appliances, and 23 per cent of the total number of manufacturers of all types of approved gas appliances in the United States and Canada are located in that territory.

Gas appliance manufacturers in California and other Pacific Coast states have experienced considerable delay in securing A. G. A. approval of their products because of the freight distance from the Laboratory. Freight and express charges for transporting their appliances to and from Cleveland are also greater than for manufacturers east of the Rocky Mountains. In cases where appliances failed to meet the approval requirements when first submitted, western manufacturers under the original plan were required to have their appliances returned to them for changes and then re-submit them for approval, or depend upon some Cleveland concern to make the necessary changes for them or send a representative from their factory east to make whatever changes might be necessary to secure approval. The necessity of such procedure will be largely eliminated under the proposed plan.

Through the establishment of a preliminary testing station on the Pacific Coast, it is felt that the Laboratory can be of much greater service to the large number of manufacturers as well as to the gas companies in that territory.

Following are some of the advantages to western gas appliance manufacturers resulting from this plan:

1. Competent Laboratory engineers on the Pacific Coast at all times to aid manufacturers in the selection of the necessary models of a series of appliances to submit for test. In this way, manufacturers can avoid considerable expense and delay in securing approval by submitting the proper appliances for test.

2. Apparatus and equipment for conducting preliminary tests on appliances on both manufactured and natural gases prior to sending them to Cleveland for approval test. Both natural and manufactured gases will be available and competent Laboratory engineers will work with manufacturers in making the necessary check tests.

3. Minor changes which are necessary in order to secure approval can be checked at the testing station without re-submitting the appliance to the Laboratory.

4. A Laboratory inspector will be available at all times to make factory inspections for renewal of approval and for making extensions of approval to other models from the ones tested. In the past an inspector has been available during a few months of each year only, since it was felt impractical to keep one permanently in that territory.

After it had been definitely decided to establish a preliminary testing and inspection station on the Pacific Coast, the question arose as to its best location. Upon discussion of the matter with gas company and manufacturer representatives from the Pacific Coast states, it was finally decided to locate it in Los Angeles, for the reason that it is the largest gas appliance manufacturing center in that territory and because approximately 80 per cent of the Laboratory's Pacific Coast testing business comes from that city.

R. M. Conner, director of the A. G. A. Laboratory in Cleveland, visited the Pacific Coast in December and selected a suitable site for the station and made other preliminary arrangements incident to its establishment. A building was leased at 718 Towne Avenue, Los Angeles, and is being remodeled to serve as a laboratory and office, and the necessary piping, apparatus and equipment are being installed.

(Continued on page 92)

Eastern Natural Gas Parley Opens Feb. 26

THE Second Eastern Natural Gas Regional Sales Conference, sponsored by the American Gas Association, will take place February 26 and 27 at the Hotel Schenley, Pittsburgh, Pa.

The tentative program outline has been announced as follows:

10:00 A.M.

Opening Remarks

Our Commercial Future

Regulating Stock and Increasing Turn-Over

Customer Contacts Through Home Service

General Discussion

General Heat Application for Industrial Furnaces

Application of Luminous Flame Burner

Gas for Brass Melting

Meeting Electric Competition

Marketing Large Volume Water Heating

Promoting Domestic Water Heating Sales

Auxiliary Heating

The House Heating Market for 1931

Promoting Sales with Gas Designed Equipment

Promoting Sales with Conversion Equipment in Washington

The Eastern Natural Gas Regional Sales Council is composed of the following members:

S. B. Severson, Chairman, Dominion Natural Gas Co., Ltd., Buffalo, N. Y.; H. W. Ewald, Equitable Gas Co., Pittsburgh, Pa.; E. E. McCormick, Peoples Natural Gas Co., Pittsburgh, Pa.; L. W. McLellan, Kentucky Utilities Co., Louisville, Ky.; Robert Montgomery, Louisville Gas & Electric Co., Louisville, Ky.; Wm. F. Reid, Manufacturers Light and Heat Co., Pittsburgh, Pa.; E. R. Rothert, Union Gas & Electric Corp., Cincinnati, Ohio; F. H. Stone, Equitable Gas Co., Pittsburgh, Pa., and E. C. Weston, Columbus Gas & Fuel Co., Columbus, Ohio.

Engineers Elect Fogg as Club President

COLONEL OSCAR H. FOGG, former president of the American Gas Association and now vice-president of the Consolidated Gas Company of New York, was elected president of The Engineers' Club, 32 West 40th Street, New York, N. Y., at the annual meeting held January 27. Colonel Fogg was elevated from the vice-presidency, which office he held for two years. He also has served for a long while as a member of the club's board of governors.

Colonel Fogg is well-known throughout the gas industry here and abroad. During the war he served overseas, with the rank of lieutenant-colonel, army engineers, in charge of the construction of ordnance plants in France.

At present, Colonel Fogg is a member of the board of directors of the American Gas Association.

Natural Gas Men to Meet at Pittsburgh

AN open meeting of the Pennsylvania Natural Gas Men's Association is scheduled to be held at Pittsburgh early this month. The program committee has arranged to have this primarily a sales meeting.

D. W. Chapman, manager of the industrial gas sales department of The Peoples Gas Light and Coke Company of Chicago, will speak on "The Industrial Gas Sales Department Organization."

J. J. Digman, of the Public Service Company of Illinois, will speak on something of the history and operation of the Mid-West Industrial Gas Sales Council.

Members of the Managing Committee, Industrial Section, of the American Gas Association, are expected to attend this meeting.

R. B. Brown and Miss Hayward Wed in New York

R. B. BROWN, former president of the American Gas Association, and also president of the Milwaukee Gas Light Co., and Miss Nellie F. Hayward, were married in New York last month.

The wedding took place in the Little Church around the Corner. Miss Hayward, who lived with her mother at 266 Twentieth Street, New York, was Mr. Brown's secretary twelve years.

Mr. and Mrs. Brown are on a wedding voyage to California by way of the Panama Canal.

Mr. Brown was elected president of the Milwaukee Gas Co. in February, 1927, after serving as vice-president and general manager. In 1927 he also was elected president of the American Light & Traction Co.

Mr. Brown's favorite sport is yachting and he owns a private yacht, which he has sailed for a number of years. He is a member of the Milwaukee Yacht club.

Mr. Brown has three daughters by a previous marriage.

That "Inexorable" Gas Bill

J. F. Weedon

By JOHN F. WEEDON
Superintendent of Advertising, The Peoples Gas Light & Coke Co.

IN a recent, and extremely well written book, telling of the struggles of a writer to gain recognition and keep body and soul together meanwhile; the author remarks several times, when his fortunes are at their lowest ebb, that he *must have Money for the Gas Bill.* There is a suggestion of bitterness, and more than a little indication of a sense of expression in this inexorable need for money for the gas bill. It conveys the idea that the gas company is a sort of a tax-tyrant who will deprive him of life and liberty if he fails to produce the wherewithal to pay his gas bill.

He does not put this suggestion in so many words, but it is there just the same, and if he were the only person who had ever said it no comment would be necessary; one could pass it by, as a personal and peculiar grouch, but one is continually hearing or reading something of the same nature. Not so long ago a news story told of a girl's suicide by gas. A note she left stated that at last she had "got even" with the gas company, inasmuch as they could not collect from her the bill for the gas she inhaled to kill herself.

A gas man naturally wonders why so many people should hold this attitude towards the gas company, and perhaps the reasons are not so very deep if one will but scratch the surface of the circumstances.

There is no fundamental difference between the gas company and any other utility company or purveyor of commodities necessary to support life in the city. But we never hear these people grouching about having to provide a nickle for a telephone slug, or subway and elevated fares, or for bread and butter at the grocery. Why, then, should they pick on the gas company?

Perhaps part of the answer is contained in the fact that in modern city life gas service is almost as essential to supporting life as the air that we breathe. One may dodge buying a "slug" for the telephone, and make a call or send a postal card. They may avoid paying carfare and walk, but the best known way of boiling a kettle is on the gas stove.

More pertinent still is the fact that for all the above mentioned conveniences one pays in advance. No one expects to use the services of a transportation company without first buying a ticket. If they are unfortunate enough not to have the necessary nickle or dime they don't curse the transportation company, because they cannot ride free. They do not expect the transportation company to supply free service. The same with the telephone, the butcher and the baker. They are quite convinced and content that they must have the cash in hand before using any of these services.

But the gas company's bill is a monthly bill. Credit for at least 30 days is unlimited. They can use gas for cooking, or gas for heating, *ad-sum, ad lib, ad nauseam,* if they wish. There is no need to dig down in the jeans for a nickle or a dime before getting the use of the service. The facilities afforded are so essential to the support of life that the idea of cost or expense is no more connected with the use of the gas range than it is with the air we breathe. It is something that we simply have to have,—but which we do not have to pay for before we have it. Then again the people who find it hard to raise the money for the monthly gas bill, for the most part get their own wages by the week. The whole monthly gas bill comes out of one week's wages. As often the monthly rent does, also. Those weeks are lean weeks with people who live on a close margin. The weeks when the rent, or the gas bill, come due are denuded of "extras" and trips to the "movies."

Of course all this does not apply to people who have prepayment meters, but they are comparatively few.

So, as I see it, the case stands that because we extend a month's credit to the gas consumer, and because gas is absolutely essential to modern life, and because it is paid for after it has been consumed, and because the request for the accumulated indebtedness is made to people whose financial horizon does not extend beyond seven days, the gas bill becomes a sort of an ogre, a menace, an abomination that maketh desolation if not immediately and at once appeased; and so the gas company earns the ill-will of the gas consumer who has neither the inclination or the brains to figure out that the gas company differs not at all from the transportation or telephone company, except in the fact that it takes its pay after, and not before rendering service. In the majority of companies operating in large cities, where the circumstances cited above are most frequent, the average consumer gas bill does not exceed three dollars—ten cents a day.

If people in restricted circumstances could be educated to regard their gas bill as a daily expense, rather than a monthly one, it would have a tendency to reduce the unreasoning antipathy many of them have towards the gas company, and it might also help them to be less wasteful with gas—which must eventually be paid for.

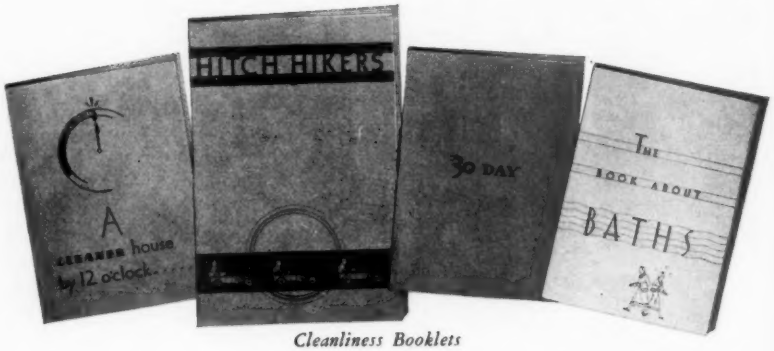
Investigation department clerks, and others that have to listen to the complaints of reluctant or poverty stricken payers of gas bills, might be of inestimable service to the gas company if they could inculcate this idea into the minds of the "poor payers"; gas is a daily expense, not merely a

(Continued on page 89)

Cleanliness Institute Mat and Direct Mail Ad Service Ready

AS in former years, the American Gas Association is cooperating with the Cleanliness Institute in preparing and distributing a series of eight advertisements for use by local gas companies in their newspapers, as well as four attractive booklets on the subject of personal and home cleanliness, health and beauty.

The series of eight advertisements, reproductions of which are herewith presented, cover in a bright and breezy, though effective manner, the principal advantages of hot water and its uses in the home. The predominating theme of this series of newspaper ads is "Keep It (Hot water) On Tap." Proofs and matrices of illustrations and text now are available at A. G. A. headquarters and will be supplied at a cost of $2 a set.



Cleanliness Booklets

While the Cleanliness Institute is interested in all of those factors which lead to and encourage cleanliness in the American home, the particular and pecuniary interest of the gas man centers on the fostering of a more general acceptance of the value of a constant supply of hot water,—the automatic hot water heater. This series of "hot water" ads should be most effective aids to the successful expansion of the use of automatic water heaters, and to this end it is recommended that they be used in a complete series, as a part of a definite heater sales campaign.

World's Fastest dishwasher
24 hour a day HotWater service is not expensive
keep it HOT on tap!
Dive in...
...without waiting for water to heat!

For Newspaper Use

Another Group of Newspaper Advertisements

In this connection the Cleanliness Institute has prepared four excellent booklets, also available to gas companies, through the American Gas Association, which constitute valuable aids to the newspaper advertising supplied not only by the Cleanliness Institute, but that supplied by the A. G. A. Art and Copy Service as well as the advertising prepared by gas company advertising departments or agencies.

The titles of these four books are as follows: *Hitch-Hikers, The Book About Baths, The 30-Day Loveliness Test,* and *A Cleaner House by 12 O'Clock.*

Hitch-Hikers is ideally equipped for the use of executives, salesmen, advertising men, publicities, home economic directors and students, as a reference book presenting the reasons why hot water is essential to the health of the home, in fact that health is the greatest social and economic asset in the community It also will prove valuable as a mailing piece to selected lists of water heater prospects. This booklet can be supplied at a cost of 12 cents each in lots of less than 100, and at 9 cents each in lots of 100 or more, plus express or mailing charges.

The Book About Baths deals with baths to keep us feeling fit; that morning bath which wakes us up; the after-work or refreshing bath; baths for summer comfort and winter health; baths to improve our poise; baths for children, etc. Baths mean hot water, thus this booklet becomes one of the gas industry's newest and most powerful salesmen for gas-heated water. Price, $2.50 per hundred, plus shipping costs.

The 30-Day Loveliness Test tells a story which presents an appeal so basically a water heating story that it should be presented to every woman in whose home it is hoped to install new water heating equipment, or increase your load by more extensive use of present equipment.

The Cleanliness Institute has already received requests for about 30,000 copies of this book, for use by gas companies in their water heating sales campaigns. The booklet presents a definite program of how any woman can secure added beauty, charm and loveliness. Price $2.50 per hundred, plus shipping costs.

A Cleaner House by 12 O'Clock portrays and stimulates the increasing interest in cleanliness as it affects personal and household routine.

Certainly hot water is needed to clean. It is needed if cleaning is to be made easier. It is required if women are to make the most of the added leisure hours resulting from better management in household affairs. A constant hot water supply helps to obtain a higher cultural standard of living. Today, people are striving for this. This booklet is really another salesman working for any company. It tells how household work can be done better and easier, and how hot water is required to make the most of those additional hours of leisure. This booklet also should find a place in a well-rounded sales, load-building, and public relations program. Price $2.50 per hundred, plus shipping cost.

Members of the Application Department of the Consolidated Gas, Electric Light and Power Company of Baltimore, Md., enrolled in the A. G. A. Course in Employee-Customer Relations. This company has a total of 641 employees enrolled in the Course.

What Does the Customer Want?*

THE newspaper headlines may announce that a thousand unfortunate Chinese were drowned by floods; that another president of Mexico has been assassinated; that the world's tallest skyscraper is being erected in New York; or that a famous motion picture actor has quit the films to go into the duck business. All of these happenings are interesting, but to Mr. Average Citizen they fade into insignificance alongside the fact that the landlord has raised the rent again, or that baby has a new tooth, or that business isn't so good. No, the real, local issue of first magnitude to a person is himself or herself. Every man and his family form the center of a little universe of their own, and they are pretty certain to judge whatever happens by the way that happening hits them. It's just human nature to do so.

Employees of a gas company who are in contact with the public and who are successful at their work, know only too well that women constitute a majority of the purchasers today; and, furthermore, that almost everything which causes a customer to be dissatisfied may be traced back to her self-respect. To state it bluntly, a woman customer wants to feel that she amounts to something.

Mrs. Jones Buys a Heater

For an example let us consider the case of Mrs. Jones. She had purchased a space heater from the gas company. She had ample means and could well afford to buy the highest priced heater sold by the company. Upon arriving home she learned that her neighbor, Mrs. Brown, had a new heater which seemed to be just as efficient and satisfactory as hers yet it was not brought from the gas company and it cost one-fourth less.

Mrs. Jones is dissatisfied when she compares the two heaters, not because she needs the difference in price between them, but because she feels she has been imposed upon. She suspects she has done a poor job of buying and fears that her husband may twit her about Mrs. Brown's greater shopping and bargaining skill. On the following day she returns to the gas company office. She freely vents her feelings to the employee who sold her the heater, and he, politely and patiently, points out a number of important features on her heater which do not appear on her neighbor's appliance. Mrs. Jones is elated, for she is now convinced that her buying sense is as keen as ever—in fact, much keener than Mrs. Brown's. Such cases occur over and over, and the employee who can handle them successfully has a tremendous opportunity for gaining the good will of the customer.

High-Bill Complaints

In the course of an average year, a majority of complaints made by customers are so-called high-bill complaints, often the most irritating and exasperating of all complaints and by all means the most difficult to handle. Patience, tolerance, tact and all the attributes of the highly efficient contact employee are often brought into play before an irate customer with an apparently justifiable complaint is won over to the company's side. Now let us look into the right and wrong methods of handling such complaints.

The Wrong Way

The customer complained that her bill was much higher than previously and that she had not used the amount of gas billed. The clerk took the bill and sent it to another office without

*Excerpt from Unit IV, A. G. A. Course in Employee-Customer Relations.

explaining what he was doing. Seeing this, the customer said, "What are you going to do about it?" The clerk then aggravated the situation further by saying, "You must have used the gas."

Customer: "But I didn't, I tell you."

Clerk: "What appliances do you use?"

Customer: "Gas range and water-heater."

Clerk: "You must leave your pilot light burning all the time. You know that uses gas."

Customer: "I don't use the little light on the range."

Clerk: "Well, I don't know anything about it then."

Customer: "I don't think you do. Every time the meter reader comes, I ask him how much my bill is going to be and he says it will be about the same as last month. This month he tells me the same thing and it is a lot more." (The clerk made no answer, for the bill came back at that point.)

Clerk: "Well, I don't know what to do about it. I guess you had better apply for a general inspection."

Customer: "Well, you ought to know what to do about it. I'm willing to do anything that's fair."

Clerk: "I'll have an inspector look over your meter and appliances."

Customer: (angrily) "All right."

The Right Way

Contrast the previous interview with the way another customer was handled by a different clerk in the same office. The customer was greeted with a pleasant smile and a cheerful "Good-morning."

Customer: "I suppose it's all right but before I pay this I'd like to know why my bills keep going up right along."

Clerk: "I'm glad you came to us. We always want our customers to feel that the charges are correct. Do you have the bill there?"

Customer: "Yes. I have been using gas from your company only for a little over three months and I brought along all the bills."

Clerk: "Now, if you will let me have your last bill, I'll send it up to the bookkeeper and have it checked over. You know we are human and mistakes do occur."

Customer: "Now that's just what I said to myself and I thought it wouldn't hurt to see. You know I think your gas costs more here. Where I lived last I paid $1.20 a thousand. Here it seems less—$1 a thousand—but you add a fifty-cent service charge and that makes it more."

Clerk: (Putting the last bill in the pneumatic tube.) "While we are waiting for this bill to come back, let us look over the bills you have. This first bill is for part of a month, isn't it. Oh! I see why you think your gas costs more here. This first bill is for exactly 1,000 cu.ft. That makes $1.50 by our rate, while it would be $1.20 by your old rate. Just let me show you how it works."

The clerk then took a slip of paper and wrote the following:

Gas Used	*Our Rate*	*Other Rate*	*Saving*
32	3.70	3.84	.14
39	4.40	4.68	.28
50	5.50	6.00	.50
	13.60	14.52	.92

Clerk: "You see your second bill is for 3,200 cu.ft. which at our rate is $3.70, but which at your old rate would be $3.84, giving you a saving of 14 cents. In fact, you have saved 92 cents in the last three months by our rate. Then notice another thing. The more gas you use the more you save."

Customer: "But I don't see how I could have used so much gas. Just look, there is 1,100 feet more gas used this month. I never used that much more. The bills just seem to be going right up."

Clerk: "Bills do seem to go up easily, don't they? Let us see if we can account for that extra gas. What appliances do you use?"

Customer: "I have a range but I don't do much baking in this hot weather. Then we have a gas refrigerator in our apartment. That's all."

Clerk: "I expect you find the refrigerator a convenience in this hot weather, don't you?"

Customer: "Yes, indeed, but that wouldn't use more gas because of the hot weather, would it?"

Clerk: "Well, it might. Here are the bills back again. They appear to be correct."

Customer: "Now that you mention it, I do remember that this is the first month we have had the refrigerator running all the time. For the last two months I'd turn off the gas and let the frost melt. Then I'd not use it for a day or so. You see, my daughter is home from college now and she is always making lemonade or something and we have to have lots of ice cubes."

Clerk: "I suppose you have to put in more food now that your daughter is home, and that means a little more cooking for you."

Customer: "Yes, that's the way it goes. She has her friends in and I like to have something for them to eat. My gracious! I expect that's why my gas bill is high. I haven't done much baking but I did some preserving and made some special desserts that my daughter likes. I'm sorry I bothered you. I expect I did use the gas all right."

Clerk: "It was no bother at all. I am very glad you came in. Goodbye."

Politeness Plus Common Sense

The clerk in this case was asked for her definition of "courtesy." "Courtesy," she replied, "is the difference in treatment between leading the customer to accept your point of view pleasantly, and trying to force your point of view on the customer. It is not just mere politeness, it is politeness plus common sense." In the way she handled her customers, she lived up to her definition. She has five rules that she follows:

Never contradict a customer.

Do not ignore or evade an answer to the customer's questions.

Do not send the customer to another person if the complaint can be satisfied otherwise.

Always admit the possibility of error. This makes it easier for the customer to admit an error later.

Always give an assurance of the company's desire to be fair, for this leads the customer to want to be as fair as the company.

Gas for Heat, Light and Power

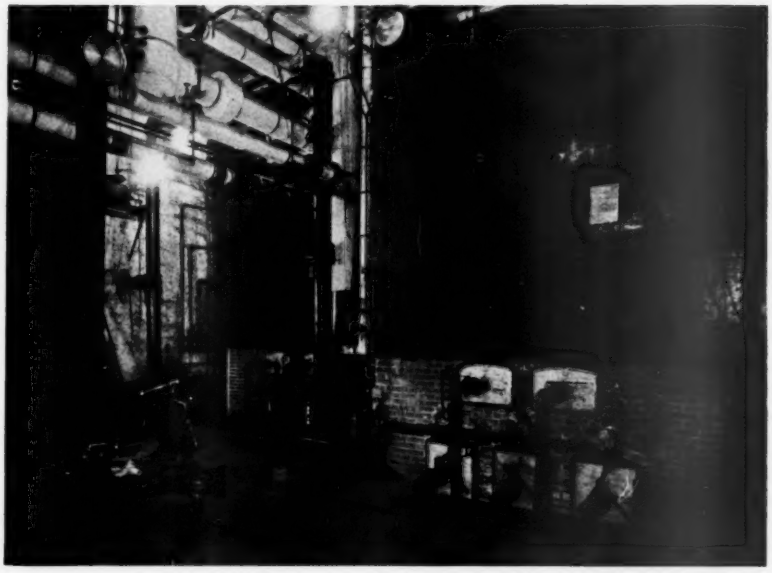
WITH the use of gas a community or unit can be rendered self-sufficient and independent of any other kind of fuel and power. Gas can be made to supply light and power as well as to cook, heat, refrigerate, etc. The latter part of this program can be accomplished by direct application and the former through a steam power plant with gas as the fuel under the boilers.

A fine example of such a unified system can be seen in one of the largest department stores in the Middle West, that of Emery-Bird-Thayer Co., Kansas City, Mo. This store, which has been operating 67 years, covers almost an entire city block and is six and seven stories in height.

There are three kitchens in this store supplying a restaurant, lunch room and employees' lunch room. The regular restaurant kitchen is equipped with three gas ranges and two gas baking ranges while that for the mezzanine lunch room has one gas range and one gas oven for bread baking. The employee lunch room kitchen has two gas ranges. In addition there is a candy kitchen which is served with an oven, a candy furnace and a peanut roaster, all heated with gas fuel. There are also gas toasters, broilers, etc.

While one of America's most popular types of refrigerators uses gas directly and has no movable parts, a type which utilizes motors to circulate the refrigerant is employed but the motor power is also generated here. The power plant consists of three tubular boilers, two of 500 hp. each and one of 308 hp. Each of the larger boilers is heated with five gas burners and the smaller with four burners. Power consumption in this store each day, from 8:30 A.M. to 5:45 P.M., averages in excess of 600 kw.

The steam from the boilers is used to operate steam engines which in turn drive the generators. There are five generators ranging from 60 to 400 kw. This energy is employed in more than 7,000 lights, 50 odd motors of varying horsepower and 450 fan motors. Among the larger motors may be mentioned that for the cash pneumatic tube system which is 75 hp., 40 hp. motor for the centrifugal water pump for the boiler feed and one of 30 hp. for the 16-ton refrigerating machine. This refrigerant machine supplies seven cold boxes and cools the drinking water all over the building. The package delivery system, consisting of gravity and belt conveyors, uses several motors.



Gas-Fired Boilers for Steam Generation

By J. B. NEALEY
American Gas Association

The building is heated with waste steam from the boilers. While there are many kinds of gas-fired furnaces on the market which heat buildings with hot air, hot water or steam, of course waste steam is by far the cheapest, all other things being equal. First, however, all of the engines exhaust into an 850 hp. water heater for the boiler feed. The steam is then exhausted to the atmosphere through a flue that rises through the building and roof.

This flue is equipped with a back pressure valve which is open in the summer allowing all of the waste steam to escape. In the winter, however, this valve is closed a sufficient amount to maintain a constant pressure on the heating system which is fed through a takeoff pipe from the flue and which is located between the hot-water heater and the back-pressure valve. The heating system consists of steam radiators with supply and return pipes. The boiler feed water is maintained at from 210 to 222° F. according to the pressure on the heating system which varies with the weather outside. All of the hot water used in the building is also heated in a tank equipped with a steam coil and using exhaust steam.

The boilers in this store were originally designed for coal firing but were converted to gas firing by the installation of gas burners. Regardless of the type or size of steam boilers gas burn-

(Continued on page 82)

Research Progress in Eliminating Industrial Gas Burner Noises

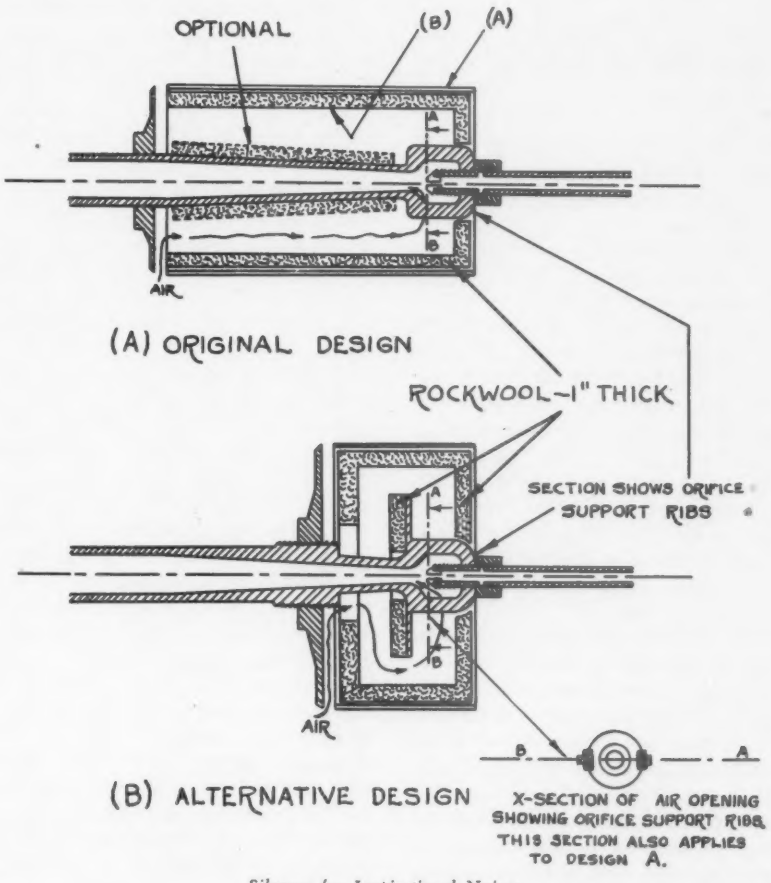
IT might be said that, until very recently, noise in industry was taken for granted. In fact the statement that, "Noise, like the poor, will always be with us," seems to reflect public sentiment. Noise, however, may become decidedly objectionable on account of the physiological annoyance caused, resulting directly in a reduction in efficiency, and a corresponding decrease in the usefulness of the industrial worker, and the esteem in which the equipment causing the noise is held.

The Committee on Industrial Gas Research of the American Gas Association is conducting an investigation of noises in industrial gas burners at the A. G. A. Testing Laboratory. The purpose of this work is to eliminate noise associated with certain industrial gas applications, in line with the committee's general plan for improving the ways and means of utilizing industrial gas. The results secured thus far are rather encouraging. Indications are that noises in industrial gas burners can be eliminated or at least reduced to a negligible amount. This is one of the 19 industrial gas research projects sponsored by the committee.

The study is a basic one involving fundamentals which have had scant attention in the field of pure research until the past several years. Noise may be defined approximately as being non-periodic and in-harmonic, that is, it cannot be represented by a mathematical expression except for a very short period of time. From the standpoint of this discussion, noise may be taken as any sound whether musical or not, which annoys, reduces efficiency, or interferes with the hearing of sounds pertinent to one's activities.

One outstanding feature of noise is the physiological sensation it produces by means of the ear. Changes of the order of one billionth part of atmospheric pressure are sufficient to produce an audible sensation. When the sound pressure is greater than that required for threshold audibility the auditory stimulus is measured in terms of sensation units. The sensation unit is that fractional change in sound intensity which is just perceptible by the ear. It has been established that the number of sensation units or sensation level is proportional to the logarithm of the ratio of sound pressures. Due to the ease with which this ratio may be measured, the sensation level of a sound is usually taken as its measure. This is true only in the absence of interfering sounds or noises. Sensation level and loudness, except for technical work, may be used interchangeably. Noise, however, cannot be classified by the pressure characteristic alone, since it generally consists of a group of sounds of varying frequencies. The frequency range of audition extends from 17 to 17,000 cycles per second and the ear is most sensitive to sounds of a pitch of about 1,000 cycles.

When there are two noises present, for instance speech and room noise, there are three important effects taking place: First, the masking effect of noise upon speech lowers the intensity or sensation level of speech; second, for complex sounds the masking effect is unequal for different frequency ranges; and third, there is a combina-



Silencer for Inspirational Noises

tion of the two to form one or more new sounds in the ear canal.

The fact that one noise may mask another so as to render it inaudible or unintelligible is used as the basis of one method of measuring noises. It also allows interpretation of the interference between speech and a room noise. An instrument called the audiometer was constructed and adapted for the Laboratory work with noises containing most of their energy in the lower frequencies. Quite a number of methods of sound measurement were studied in the early stages of the investigation.

At the outset of this research it developed that the noises present during the operation of industrial gas burners originated from two general sources: First, inspirational noises which are caused by the use of the venturi, orifice and air shutter as a means of supplying gas and air for combustion at the burner ports. This is particularly noticeable with high pressure gas. Second, combustion noises which arise as the result of irregular and unsystematic expansion of the products of combustion within or adjacent to the combustion zone.

A preliminary study of inspirational noises led to the conclusion that considerable difficulty would be experienced if attempts were made to eliminate them by changes involving the basic design features of atmospheric burners. Work was therefore directed toward reducing them to a minimum. Various systems of baffling and gas expanding tried were found to have but little effect on the noise produced. It was finally decided to absorb the pressure pulses which generate the noise by means of sound proofing materials. The accompanying figure shows the forms of construction employed. By the use of a silencer, a rather objectionable hissing noise that is sometimes noticeable was eliminated entirely. A silencer, or sound proofing device, may be made an integral part of the injector such that it will not interfere with accessibility to all parts. The general principles underlying its construction and operation follow: A sheet metal housing serves to hold and protect the sound absorbent lining. In addition, the lining is held in place from the inside by means of a coarse mesh wire screen. Tests to determine sound direction indicated that the majority of the sound energy was propagated outward from the orifice. Thus with the construction used nearly all the pressure pulses are impinged against the absorbent material at least once.

By use of a silencer, primary air injection is necessarily reduced. In the model constructed, the average reduction in air entrainment over a considerable gas pressure range for a fixed orifice was of the order of 2 per cent. Since this method of attack for inspirational noise was so successful, it has been decided to investigate and evaluate the controlling factors, so that fundamental rules may be available for the design of silencers.

Coincident with the work indicated above, a general study was made also of combustion noises. In order to exclude the possible effect of furnace size and shape, turbulent flames in the open were first studied. With this type of combustion, fast burning gases produce more noise than slow burning ones. The noise appears to originate in uneven and irregular burning characteristics of such a flame since in the ordinary Bunsen flame, where no noise is produced, the process of combustion takes place in a relatively stable manner.

When the study was carried on with combustion occurring in a furnace in a normal manner, it was found that the quality of the noise had changed in comparison to that of the open flame. The noise became more penetrating and annoying due to tones set up by the furnace chamber. It was found also that, for a given gas, reducing the air to gas ratio decreased the noise. The maximum noise, fortunately, is produced when the air to gas ratio is considerably in excess of the theoretical air requirement for complete combustion. As a consequence, with practically all furnaces operating at or below the air gas ratio for complete combustion, the noise produced is somewhat below the maximum which might be encountered.

It was noted that with the velocity type of burner, the flames in the combustion zone flashed rapidly blowing from and returning to the port opening. A close observation of the turbulent area revealed that the alternate flashing is synonymous with the noise pulses. It was reasoned therefore, that if combustion could be localized, and this flashing characteristic removed, the noise should be reduced.

Port plates drilled with a large number of small holes providing sufficient total area to prevent blowing were used in an effort to overcome this objectionable feature. A steel port plate providing a port depth that would preclude flash-back was found to be fairly effective in the reduction of noise with the furnace door closed. The plate was drilled with a large number of small holes. In addition, the flue outlet of the furnace was constructed to consist of a large number of very small holes instead of one large opening. This served to break up and absorb any noise wave-front originating in the furnace chamber.

With port plates of refractory material, almost noiseless combustion is provided. A difficulty encountered, however, is that a material entirely suitable for the purpose has not as yet been found. The materials used thus far are subject to the destructive action of localized heating. The use of a lattice work of refractory material in front of ports in a port plate reduces the heating effect considerably, and was found to provide for nearly noiseless combustion. Flash-back difficulties, however, are not eliminated unless particular care is taken in the proper combination of the controlling factors.

Additional work is being done with refractory materials for port plates, the characteristics of which seem to make them usable for protection against localized heating. In order to fully cover the subject, a study will also be made looking toward establishing the proper relationship between heat input, port size and total area and port depth such that flash-back and blowing will be prevented. Other types of combustion causing noise will also be covered in future work.

It has been demonstrated that noises in industrial gas burners can be reduced or eliminated. It seems that the proper application of the principles involved should make factory surroundings more pleasant, reduce fatigue resulting from noise, yield rather large dividends in the way of in-

(Continued on page 82)

Chimney Construction and its Relation to Condensation from Gas House Heating Equipment*

By C. GEORGE SEGELER
Industrial Engineer, American Gas Association

ALTHOUGH this subject has come up for attention at a recent convention of the Plumbing Inspectors of the State of Wisconsin, and it has been recognized as an important situation demanding attention by the gas fraternity, it is not fair to draw the conclusion from such activity that anything like a universal problem exists in regard to the subject. There are both technical and commercial aspects to the situation which are well worth a careful consideration.

The legislative aspect to the problem is of great interest because the drainage of chimneys connected to gas equipment would undoubtedly come under the jurisdiction of the various State Plumbing Inspectors. It is important that these groups be properly informed on the necessity of dealing with condensation from chimneys and on the best methods of doing it. It will fortunately be unnecessary to require the drainage of all chimneys; nor does it follow that because drainage of chimneys is occasionally required in one town, it will be desirable in another.

The proper understanding of condensation of water vapor from flue gases presupposes a knowledge of their composition, temperature and volume. This has been studied recently and the results are summarized here.

The result of investigation of various gases is shown in Table 1. This gives the flue products of four characteristic gases such as are in common use in various parts of the United States. In the first nine columns the constitutents of the gas in per cent by volume have been tabulated, then the cubic feet of air required for each cubic foot of gas burned, both for theoretically perfect combustion and for average combustion conditions such as might be found in central house heating appliances using gas which bear the American Gas Association Laboratory Seal of Approval. The next four columns show the average flue products produced for each cubic foot of gas burned.

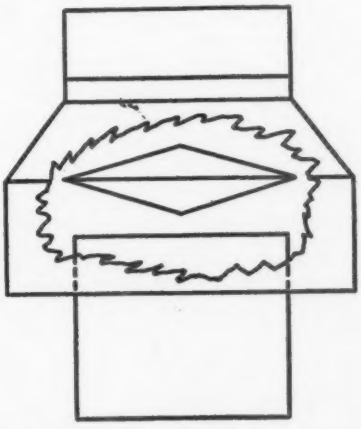


Fig. 1—Diagram of a backdraft diverter

All approved gas equipment must have draft hoods (also called "backdraft diverters") as shown in Fig 1. These draft hoods are installed in a vertical position† as close as possible to the boiler, and act in three important ways‡:

1. So that gas furnace or boiler may operate without any draft other than that provided by the design of the appliance itself.

2. So that air from the cellar may be added to the flue gases to reduce their dew point.

3. So that "no draft in chimney" or "back draft" will not affect the operation of the appliance.

Table 2 on page opposite shows the flue gas conditions just ahead of the backdraft diverter, the gases being the same as considered in Table 1.

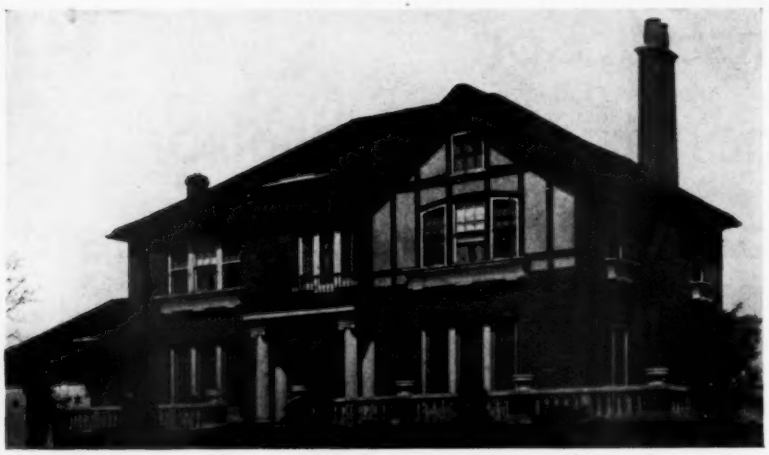
Table 3 indicates the flue conditions in a typical chimney flue as found after the diverter, assuming that 50 per cent by volume additional air enters at the apron of the diverter.

Anyone dealing with the problem of water vapor condensation should

Table 1
TABLE OF GAS COMBUSTION BASED ON BURNING OF 1 CUBIC FOOT OF GAS

	Constituents of Gas—Per Cent by Volume									*Cu.Ft. of Air Required for Each Cu.Ft. Gas Burned*		*Flue Products for Average Combustion Cu.Ft. per Cu.Ft. Gas Burned*			
								Illuminants							
Gas	*CO*	CO_2	H_2	N_2	O_2	CH_4	C_2H_6	C_2H_4	C_6H_6	*Perfect Combustion*	*Average Combustion*	O_2	CO_2	N_2	H_2O
Natural Gas, Cleveland	....	....	....	1.3	....	80.5	18.2	....	....	10.70	15.00	1.0	1.2	12.4	2.2
Retort Coal Gas, Horizontal	8.6	1.5	52.5	3.5	0.3	31.4	....	1.1	1.1	5.00	7.00	0.3	0.5	5.5	1.2
Coke Oven Gas, Koppers	6.8	2.2	47.3	6.0	0.3	33.9	....	2.6	0.9	5.23	7.50	0.4	0.5	5.6	1.2
Carburetted Water Gas	33.4	3.9	34.6	7.9	0.9	10.4	....	6.7	2.2	4.37	7.76	0.5	0.7	6.8	0.7

* Reprinted from Domestic Engineering, Jan. 10, 1931, and extended to cover vent pipe materials.
† Some research is being done on horizontal diverters.
‡ Installation of gas heating equipment without draft hoods is practiced in isolated localities. See Gas Age-Record, Mar. 17, 1928, Chimney Flues, Vent Piping and Drains by H. J. Dropp.



Gas heated house showing a greatly exposed chimney which would be considered undesirable, and which does not even add to the architectural beauty of this lovely home. The chimney is extended, however, to bring the top higher than the highest part of the roof, which is good practice

be familiar with the fundamental physical laws governing this phenomenon. A term which will be used frequently throughout this article is *partial pressures*. By this is meant that portion of the total barometric pressure in a chimney stack contributed by any one of the flue gases. Although the pressure in a chimney is slightly below normal barometric pressure, because of the draft in the chimney, the values of this draft expressed in inches of mercury are extremely small, as is well known. It is therefore quite proper to assume that the partial pressures are proportional to the concentrations in which the various flue products occur. Dalton's law of partial pressures states that each gas exerts a partial pressure equal to that pressure that the gas would exert if the same weight of gas as present in the mixture were present all by itself in the space in question. From this it follows that partial pressures are proportional to the concentrations expressed in volumes.

From Table 3 it will be seen that a typical natural gas such as obtained at Cleveland would yield 25.2 cu.ft. of total flue gases for each cu.ft. of gas burned. Of this 25.2 cu.ft., 2.4 cu.ft. would be water vapor—that is to say, about 10 per cent is water vapor. Since the pressure in the chimney for all practical purposes is normal atmospheric, this means that the partial pressure of the water vapor is about 10 per cent of an atmosphere. From the Marks and Davis Steam Tables, it is found that the condensation point corresponding to a partial pressure of 0.1 atmosphere is 112° F. In a similar manner the dew point, or condensation point, for the other typical gases has been calculated.

Referring to Mr. Dropp's article (loc. cit.), the Milwaukee practice, which is rather different from the general practice throughout the gas industry, should be noted. No backdraft diverters are used on central house heating appliances in Milwaukee. As a result of this, the dew point of the flue gases in Milwaukee is at slightly higher temperatures. As indicated in Table 2, the approximate dew point for Milwaukee gas should be in the neighborhood of 130°, whereas the dew point of house heating flue products where a backdraft diverter is used is some 10 to 20 degrees lower.

Table 3
CONDITIONS IN TYPICAL CHIMNEY FLUE*
After the Diverter

Gas	1 Flue Products Including Air Added at the Diverter Cu.Ft.	2 Total Water Vapor Volume Cu.Ft.	3 Partial Pressure of Water Vapor in Atmospheres	4 Dew Point °F.
Natural Gas, Cleveland	25.2	2.4	.095	112
Retort Coal Gas, Horizontal	11.3	1.3	.115	119
Coke Oven Gas, Koppers	11.5	1.3	.113	118
Carburetted Water Gas	13.0	.82	.063	98

*All values based on the burning of one cubic foot of gas.

Table 2
CONDITIONS IN TYPICAL CHIMNEY FLUE*
Ahead of the Diverter

Gas	1 Total Flue Volume	2 Partial Pressure of Water Vapor in Atmospheres	3 Volume of Added Water Vapor Due to Air Moisture	4 Corrected Partial Pressure of Water Vapor in Atmospheres	5 Dew Point °F.
Natural Gas, Cleveland	16.8	.13	.137	.14	123
Retort Coal Gas, Horizontal	7.5	.16	.064	.17	132
Coke Oven Gas, Koppers	7.7	.155	.068	.17	130
Carburetted Water Gas	8.7	.08	.071	.085	106

*All values based on the burning of one cubic foot of gas.

What are the Flue Temperatures?

Central house heating gas appliances operate at minimum efficiencies of 75 per cent for steam and hot water boilers, and 70 per cent for warm air furnaces. Since the equipment itself is very well insulated, the radiation loss does not run much over 5 per cent. This leaves a flue gas loss of about 15 to 20 per cent to be accounted for. The temperature corresponding to flue gas losses of this magnitude is far above the condensation point. The average flue temperature conditions of appliances bearing the A. G. A. Laboratory Seal of Approval are as follows:

	Boilers	Furnaces*
Flue temperature	255°-365°	315°-556°
Per cent CO_2 in the flue gases	At 255° 8.4%; At 365° 7.6	At 315° 5.8%; At 556° 8.5

*Certain fan type gas warm air furnaces have been approved for operation under condensation conditions. These constitute a special case. However, air is diverted to the stack to reduce the chimney gas dew point.

Right at this time it might be well to point out that over-ventilation, which will result in lower flue temperatures, also results in lower partial pressures of water vapor, so that no direct conclusion can be drawn from a consideration of the flue temperatures alone. They must be considered in connection with the complete flue gas analysis.

Another exterior of a gas heated house, showing exposed chimney of inadequate height. Such an installation is very likely to give trouble

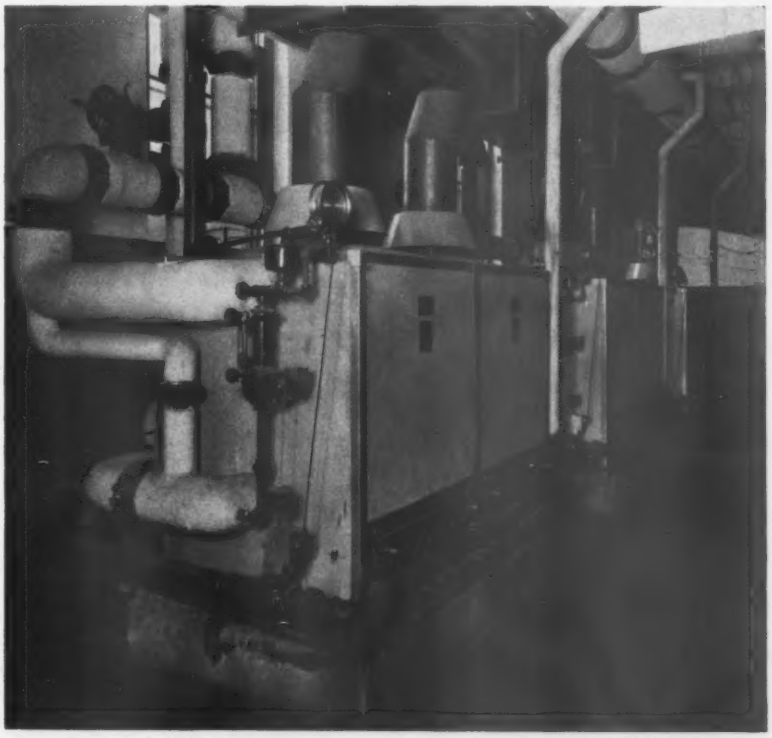
Nevertheless, there are some cases when condensation occurs. It is evident that the flue conditions must be extremely poor when condensation can occur under the conditions mentioned. Reference to Table 3 will show that the average dew points are not so very many degrees above room temperature.

Outside chimneys are the principal cause of condensation troubles. As the flue gases pass up the chimney, the layers next to the exposed side of a chimney flue can very readily be chilled below their dew point. At the same time, the average temperature of the flue gases could be well above the condensation point. This particular phenomenon has been the subject of an extensive investigation on the part of the British gas industry.* The British report states that the temperature gradient across the average flue is steeper than previously supposed. Remixing of the flue gases at the point where condensation begins is suggested as a possible remedy. This would raise the flue temperatures above the dew point at the gas layer in contact with the chimney walls.

When Condensation Occurs

When condensation occurs, it is nothing but distilled water which is forming on the cold surfaces. This in itself would be practically harmless if it were not for the presence of a small quantity of sulphur in the original gas. State laws, which are strictly enforced, restrict the sulphur as follows: hydrogen sulphide, absolutely none; organic sulphur (carbon bisulphide principally), not over 30 grains per hundred cubic feet (average gas company practice keeps this figure between 5 and 25 grains per hundred cubic feet). The burning of this sulphur produces sulphur dioxide (perhaps some sulphur trioxide too), which is soluble in the condensate water. Sulphurous (and/or sulphuric) acid are formed in this way, and the destructive action of this material is too well known to require further comment. The solution of sulphur dioxide continues until quite a high concentration of the acid is reached. Similarly carbon dioxide dissolves in the water making the solution contain a mixture of the sulphur acids with carbonic acid.

The acid condensate water is destructive to brick and mortar, as well as the metals used for the vent connection between the appliance and the chimney flue. Such materials as cast iron, vitreous tile, glazed sewer pipe, and certain other products are impervious to the action of condensate water. Therefore the connection of appliances burning manufactured gas should always be made to properly lined chimneys. All gas companies make an inspection of the chimney before completing the sale of gas house heating equipment and many of them refuse installation where no proper linings exist, or arrange to have lining installed.



Large gas heating installation showing application of backdraft diverters and proper connection of flue pipes to a common flue manifold

*Gas Journal (London), January 15 and 22, 1930.

What About Joints?

The lining may be satisfactory but the joints should also be considered. Mr. Dropp (loc. cit.) summarizes this feature of chimney construction as follows:

"Sewer pipe besides having a desirable joint is specially glazed, making it impervious to water and acids, and is as cheap as ordinary clay liner.

It is also made in fittings which should be used for offsets, inlets and turns of any kind. An acid-proof cement which is acid proof toward concentrated sulphuric acid, insoluble in water, may be used for the joints, as it only comes in contact with a very small quantity of vapors due to the tight bell and spigot joint of the pipe itself. Lead wool may be substituted for the cement and then should be covered over with cement mortar. Sewer pipe has only one disadvantage and that is its setting. It is found more difficult to set than ordinary square or oblong clay liner as it has projecting bells necessitating more mason labor in its supporting.

"Cast iron pipe makes an ideal liner for chimneys as its joint does not depend on cement for a leak-proof joint. Cast iron is impervious to sulphur acids and water. . . . It has great disadvantages in its laborious setting, and always requires an extra contractor who must wait for the masons to build their part of the chimney before he can set the next section. The cost of a cast iron flue is higher than that of an ordinary clay or sewer pipe liner."

The more common glazed tile lining can also be satisfactorily joined with just ordinary care when the chimney is built. The tiles should be set square on top of one another with the thinnest possible bond of cement mortar between.

Natural Gas is Different

Turning for a moment to those parts of the country where natural gas is used, an entirely different situation must be recognized. Natural gas is now available in 22 States, and from all indications its use is growing rapidly. The great advantage as far as flue construction is concerned is that natural gas* contains no sulphur, and flue problems are practically non-existent in the natural gas areas. Even where very bad flue conditions exist and considerable condensation occurs, nothing much need be done about it save to provide a dry well at the base of the chimney flue, or possibly to drain the condensate, if it is excessive in quantity, to a nearby sewer. However, in making such a connection it must be recognized that the trap of such an installation is likely to dry out during the summer months unless provided with a special filling connection (which will soon fall into disuse), as rain water cannot be expected to keep the trap filled. Since there is a direct connection to the basement of the house through the opening at the backdraft diverter, it is possible that an unpleasant situation might arise with a dry trap connected to a sewer.

The absence of sulphur in natural gas makes it possible to utilize galvanized or black iron vent connections without any trouble from corrosion. A little further in this article the subject of vent pipe connections will be given detailed study.

What Time of the Year is Worse?

Confining the study to manufactured gas, because the sulphur in that product causes the troublesome jobs, the conditions surrounding condensation can be further discussed. When will condensation take place? Experiences differ on this point, but general belief is that condensation is most serious in the late Spring and early Fall, because of the relatively intermittent operation of the equipment. This tends to keep the chimney walls at lower temperatures, and therefore condensation may occur. In the Winter months, during the period of heaviest load, the chimney walls are kept hot by the flue gasses. Of course outdoor temperatures can go so low that outside stacks will cool too much even if the equipment is burning steadily. This is one of the obvious reasons why exposed stacks are undesirable.

Conclusions that so far can be summarized are as follows:

1. Many chimneys built directly on gravel or sandy ground automatically take care of condensation if it should occur.

2. Chimneys connected to gas fired boilers should be properly lined with the materials discussed in this article, or with other suitable lining materials which experience might dictate. In these, should condensation occur, drainage is a simple problem.

3. Outside chimneys, especially with offset flues, form the bulk of the troublesome jobs, not only because of condensation collecting at the base, but because of open joints which may permit condensation to ruin plaster and wall paper.

4. Trouble from condensation is encountered in about 2 per cent of the installations in a limited number of localities. Trouble in natural gas territories occurs very rarely, and with regard to the manufactured gas territory, reference may be made to Table 4, which is an analysis of the chimney construction and operating conditions in some 21 cities variously located throughout the United States.

Table 4 is worthy of considerable study. It will be observed that from 2 to 3 per cent of the installations seems to be the average estimate of the number of chimneys which cause trouble. Survey of the reasons given as to the cause of the trouble clearly shows that outside chimneys and long vent connections were the worst conditions encountered.

Methods of correcting condensation troubles are particularly interesting, because it will be seen that the conditions can be remedied in most cases by simple structural changes. The need for lined chimneys has been stressed in this tabular analysis and elsewhere in this article. It is a basic gas company policy to use lined chimneys with all gas burning house heating appliances. Architects and builders are urged to construct their chimneys in this manner.

What Should be Specified?

It has been suggested that specifications be devised for the construction of chimneys for use with gas boilers. The adoption of such specifications would undoubtedly improve chimney construction for all types of house heating appliances, and the principles involved, briefly summarized, should include:

That all chimneys be lined, where possible with No. 1 glazed sewer pipe or glazed lap jointed clay liners, hav-

* Some natural gases have been found containing sulphur, but they have a small local sale.

Table 4

ANALYSIS OF CHIMNEY CONSTRUCTION

City	*% Chimneys Causing Trouble*	*Cause of Trouble*	*How Corrected*	*Comment*
Baltimore	2 to 3%	Outside chimneys and low flue gas temperatures.	Drain to receptacle or dry well. Have a few cases where this is necessary.	
Boston	About 5%	Long flue runs of 25 and 30 feet, hydrogen content of gas used, poor draft conditions.	Usually poor draft conditions are corrected by lessening gas load which is equivalent to increasing the chimney capacity; increasing height of chimney to insure positive draft; using a fan (impeller of the blower should be chrome-plated).	
Brooklyn	Very few	Too long runs	Drains, and in two cases blowers.	
Buffalo	None from Gas Co. installations; some others	1. Too long horizontal run. 2. Too large an outside flue. 3. Down draft conditions.	1. Nearer flue, or flue gas temperature raised by changing damper positions. 2. Sometimes a brick removed from base of chimney to allow air to sweep through stack helps. Sometimes a chimney lining is recommended and condensation allowed to drain into the cellar.	
Chicago	About 2 or 3%	Chilling of flue products having a relatively high dew point.	Sometimes leave a brick out of bottom of chimney so that chimney is vented. In many cases we line chimneys with allegheny metal, etc., and run drains to sewers or through the floor when on sandy soil.	
Cincinnati	About 2%	Products of combustion coming in contact with outside cold flue.	Enlarge depth of cleanout. Drain to sewer. Suggest relining flues if not already lined.	See attached Code for Cincinnati.
Dallas	No trouble.			
Denver	First year 3% Second year 5% Third year 10%	1. Low stack temperature on gas designed installations. 2. Chimney on north wall and built out from wall. 3. Extremely high chimneys—2 and 3 story buildings. 4. Chimney built of soft porous brick.	All chimneys are lined with lead coated iron when the job is installed if the customer will stand the cost. On unlined chimneys, lining is installed at first indication of condensation. Should the chimney be in such bad condition as to require rebuilding, it is rebuilt with a vitreous tile lining. Have never found it necessary to put in dry well or drain to sewer.	Cleanout openings in the chimney are provided on all jobs and customer is instructed to see that chimney is clear at all times.
Fall River	60% (Most of these are hot water installations)	Excess condensation is due to low water and flue temperatures on hot water installations and in a few instances to old flues becoming plugged.	In some cases an attempt to ventilate the flue further has been tried and in others the gas consumption has been increased.	Condensation has caused difficulty not only in flue but in old unlined chimneys causing disintegration of brick and mortar and stains through the plaster.
Kansas City, Mo.	Considerable		Recommend to house owner to rebuild chimney under present building code, which requires tile lining.	
New Haven	½ of 1%	Outside chimneys, location of boiler, length of flue.	Build dry well, substitution of draft leg in flue near chimney for draft hood in boiler, in one case had chimney rebuilt.	Conditions in this locality do not necessitate extensive changes. In making installations conditions which may cause trouble are considered, particularly on hot water jobs.
New York	Very few, if any	Outside chimneys.		
Philadelphia Division A		Mostly where chimneys are built on outside of building with three sides exposed.	Drain to sewer.	
Division B	Practically none	Outside chimneys.		
Division C	Had four	Poor draft conditions in three cases; one case chimney too small.	Installed Allen Turbine ventilators at top of chimneys.	
Division D	About 3%	Cold chimney, long flue runs, too much secondary air, other appliances connected to same flue.	Dry wells.	
Pittsburgh	No trouble.			
Portland, Ore.		Outside chimneys; extreme chimney exposure; sluggish draft.	If conditions do not permit remodelling flue, sewer drains and dry wells and in some instances blowers. Safety provisions made with blowers to avoid immediate trouble in case of failure of blower.	Employ appliances not inherently condensation producers. Use of short vents. Inside flues when possible. Lining outside flues with glazed tile. Bypass quantity of heat from fire box to vent to maintain temperature.
Rochester	1%	Construction, location, height, and type of appliance.	Line chimney. Clean out if necessary. Increase height of chimney. Insulate flue with two layers of ¼" aircell asbestos from appliance to chimney.	
Seattle	6 hot water jobs out of 650 installations of all types.	Long vents, outside chimneys, low stack temperature, faulty construction of furnace, plugged flues, exposed vents.	Increase gas consumption. Where chimney is new and damp build a fire in the chimney.	Flues should be tile lined and installed in an inside partition. Vents should not be over 12 ft. horizontally (depends on flue gas temperature). Flues should be carried above highest point of roof.
St. Louis	Practically all unlined flues.	Down draft during the off period of the appliance, cooling flue.	Line flue.	
Washington, D. C.	2%			

ing the bells of the sewer pipe, or the joints of the clay liners, facing upwards so that moisture will not leak out. Less desirable, but much cheaper and still satisfactory construction, is the use of ordinary glazed tile liners with the thinnest possible cement joints. Offsets should be avoided as much as possible, but where they occur, proper fittings should be employed.

Very often offset flues are encountered, especially on outside walls, where the offset is not equipped with any form of lining. Of course condensation, or rain for that matter, runs down into the open joint, so that trouble soon results.

Of special interest to the plumbing and heating trade in connection with the drainage of chimneys is the possibility of ordinances being enacted setting forth the methods of chimney construction for gas equipment and

drain construction. Analysis of Table 4 indicates that legislation for improving conditions is not necessary or even desirable, and would certainly prove burdensome to the general public. If any considerable proportion of the chimneys should cause trouble, it would certainly be most important to urge legislation to protect the public. Since new legislation brings with it the manifold problem of enforcement, the better method for forestalling trouble in the small percentage of chimneys involved is education of builder and architect to the modern chimney requirements. As a matter of fact, the policy of gas companies in connection with servicing their equipment and cooperation with dealers is such that the danger from unsatisfactory chimney operation is very much minimized. The gas companies throughout the country make very careful service inspections before permitting the installation of gas boilers, and the effectiveness of such inspection is proved by the small number of cases in which trouble has occurred.

Are There Special Chimney Ordinances?

Cincinnati and Portland (Ore.) have notable ordinances in regard to chimney construction, most of the clauses of which deal with the method of lining the chimney, the areas required, the capping of chimneys, and the distance which chimneys shall be required to project above the roof. The regulations do not require drainage, and reference to Table 4 will show the reason why. When condensation occurs in Cincinnati, the cleanout door is enlarged and deepened, permitting drainage to seep into the ground, and if necessary a drain to sewer is provided. In Portland the gas company supervision is very active and many excellent methods have been employed to improve conditions where trouble has occurred.

Fig. 2 shows the size of chimney flue desirable for use with gas burning appliances.

No one realizes the need for good chimneys better than the gas house heating engineer. The foremost requirement of the chimney is that it shall have satisfactory draft; that is to say, the chimney must be carried at least two feet beyond the highest point of the building, and the general principles involved are shown in Fig. 3. Second, the chimney must be lined. Third, there should be a cleanout door at the lowest accessible point in the chimney. And fourth, the chimney should be an inside chimney rather than an exposed chimney.

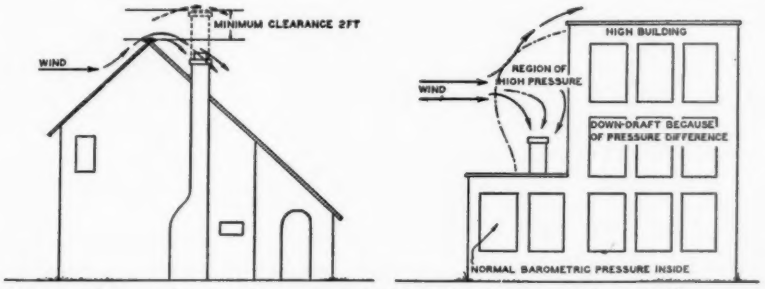


Fig. 3—Diagram showing the cause of backdraft in chimney. If an inside pressure greater than the outside pressure could be maintained at all times, there would be no backdraft. Since this is impractical, the chimney is constructed so that it rises above outside high pressure areas

What About the Vent Pipe?

A satisfactory vent pipe connection is just as important as a good chimney. In fact, this part of the gas heating system deserves very careful attention because of the unsightly state into which vent pipes fall if any considerable corrosion takes place. Any gas house heating engineer will affirm that the hot water boilers cause the greatest amount of trouble in regard to vent pipes. In order to see what effect flue gases had on different materials, a study has been made of some 21 cities in the United States, and the results are reported in Table 5. This survey covers the same cities reported in Table 4, and again there is a wide difference in the results obtained.

It will be noticed that the natural gas areas, such as Kansas City, Mo., for example, report that galvanized iron of 24 gauge or even lighter gives no trouble whatsoever with many thousands of installations under observation. On the other hand, Baltimore, in the manufactured gas territory, reports that galvanized iron gave very unsatisfactory results.

Copper is received in great favor by almost all cities in which it has been tried. Aluminum appears highly serviceable in Chicago, but it is not so well thought of elsewhere. The modern high chromium alloy steels are not looked on with favor because of cost and difficulty of making up the flue pipe.

It is evident that no positive conclusions can be drawn at this time as to the best material to use. Under the

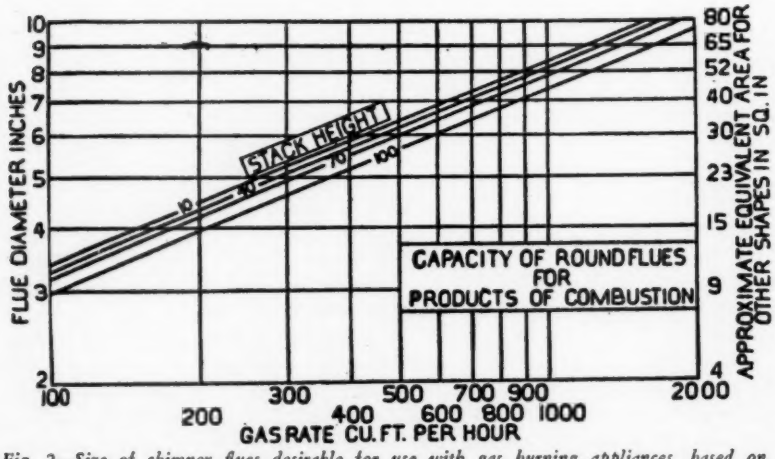


Fig. 2—Size of chimney flues desirable for use with gas burning appliances, based on gas rate in cubic feet per hour

Table 5
ANALYSIS OF VENT PIPE MATERIALS

City	*Metal*	*Gauge*	*No. of Installations*	*Life*	*Comment*
Baltimore	Galvanized iron	28	Very few	3 to 12 months on or two seasons.	All of these answers apply to flue between boiler and chimney and not to the flue in the chimney.
	Copper	16 oz. per sq.ft.	Several hundred	Do not know	
	Lead	⅛"	Several hundred	Lasts indefinitely	
	Aluminum	22			
	Terne plate	28	Several hundred	2 to 3 seasons	
Boston	Copper	16 oz.	1,100		Some discoloration but no damage.
	Lead coated iron		500	2 years	
Brooklyn	Galvanized iron	Gauge depends on size flue and strength required		2	Worse than black iron.
	Black iron			3	
	Aluminum			Indefinite	
	Wilder metal				
Buffalo	Galvanized iron				
Chicago	Galvanized iron	24	Few	1 or 2 years	Short life.
	Black iron	24	Very few	1 year	Short life.
	Lead coated iron	24	Several hundred	Few years	Coating often scratched off when making up flue.
	Allegheny metal	24	50	Indefinite	Seems to be the best of any metal we have used.
	Aluminum	18 to 24	2,000	Indefinite	Fairly good; some corrosion shown.
Cincinnati	Galvanized iron	22			Painted with black asphaltum.
	Copper		Few		
	Tile				
Denver	Galvanized iron	26	352		On gas conversions.
	Black iron	26	3,525		On gas conversions.
	Lead coated iron	26	2,955		Mostly on gas designed.
	Copper	28	5		In service less than one year.
Fall River	Galvanized iron	22 to 24	150	2 to 5 years	Apparently as good as anything. Galvanized coated with asphaltum in two years on several jobs and still good.
	Lead coated iron		2	1 year	
	Copper		1	5 years	Boiler with considerable condensation.
	Alloy steels		40	1 to 2 years	No better than galvanized.
Kansas City, Mo.	Galvanized iron	24 or lighter	10,000	Indefinite	No trouble whatever—(Natural gas).
New Haven	Galvanized iron	26	400		
New York	See comment				Accelerated laboratory tests show stainless steel best economic material. Aluminum deposits considerable aluminum sulphate after a few years. Monel becomes slightly pitted; exposed copper stacks completely disintegrated.
Philadelphia					
Division A	Galvanized iron	26	108	2 years	
		Armaco	74	Still O. K.	
	Lead coated iron		1	3 years	
	Copper		1	2 years	
				Still O. K.	
Division B	Galvanized iron	24 Armco	65	2 to 3 years	With tile lined flue and space at bottom where vent pipe enters have lasted 4 and 5 yrs.
		26-28 or lighter	145	1 to 2 years	Installed by outside contractors.
Division C	Galvanized iron	24	275	7 to 10 years	
Division D	Galvanized iron	24	300	4 to 5 years	Where condensation is encountered 1 to 2 years.
		24 Armco (Flat)	300	?	Apparently satisfactory after 1½ years.
	Aluminum		1		Only installed 6 months.
Pittsburgh	Galvanized iron	24			In four years' experience have not had to replace any (Natural gas).
Portland, Ore.	Galvanized iron	24 U. S. S.	500	2 years	Life materially shorter in presence o condensation.
	Black iron	24 U. S. S.	Few	1 year	Unsuitable in presence of condensation.
	Lead coated iron				Have never been able to obtain satisfactory lead coated iron.
	Copper	14 & 16 oz.	5,000	5 years	Most satisfactory metal so far obtained.
	Monel metal	26 U. S. S.	100		About equal to copper.
	Alloy steels				Those employed unsatisfactory.
	Aluminum				A few jobs proved failures.
	Vitex		Few	?	Very promising although tests have continued 1 year only.
	Glazed tile		100	?	No deterioration after long use but joints leak.
	Unglazed tile		Few	3 years	Crumple after short usage.
Rochester	Galvanized iron	26 to 22	558		Life of vent depends entirely upon circumstances With excessive condensation 20 oz. copper stands up best, otherwise 22 or 24 gauge galv. iron is most satisfactory. Very little experience with alloy steel.
	Copper	16 to 20 oz.	25		
	Alloy steels	12	12		
	Aluminum	26	20		
Seattle	Galvanized iron	24		More than 5 years	Do not advise use.
St. Louis	Galvanized iron	20	500	2 to 3 years	
	Wilder metal		500	5 years	
Washington, D. C.	Galvanized iron	26	500	8 years	Our oldest installation is 8 years old and to date we have never found it necessary to replace a flue.

rcumstances, it might be advisable to use the cheapest material, but the pride taken by a house owner in a gas installation usually warrants a slightly greater expenditure on flues so that the connection may never look unsightly.

The question of which way to pitch the vent pipe is often the subject of discussion. The quite general method is to pitch the flue up towards the chimney, even though this would have a tendency for condensation, if any, to run out at the apron of the backdraft diverter. However, the flue pipe is generally warm enough that condensation does not occur in it. In long run flues, they must be pitched up to the chimney, usually maintaining a rise of 1 inch to the foot of horizontal run. In short flues connected to boilers with good draft, the practice of pitching the flue down from the

(Continued on page 82)

Municipal Plant's Sale Pleases Mayor

ALEXANDRIA, VA., one of the oldest cities in the country, has solved one of its latest problems by selling its municipal gas plant to private interests.

The story, "Why Alexandria Sold the City Gas Plant," was told in the January, 1931, issue of *Nation's Business* by Mayor Carroll Pierce, of Alexandria. Believing the subject of far-reaching interest to the industry the American Gas Association had copies of Mayor Pierce's article reprinted and distributed to its membership.

"We sold our gas plant. That does not mean that we have surrendered to 'the interests,'" stated Mayor Pierce. "On the other hand, I suspect that our regulation of service will be more effective and our insistence on proper standards a bit more stubborn under the new arrangement. Indeed, I am sure that we are in a more favorable position to demand service than we were before. What's more, we'll get it. The plant will be worth more to us in private hands than it was under municipal management.

"Not that our municipal gas plant was not efficient, conscientious and courteous. I am willing to stack it up against any similar department in all these things. But municipal management necessarily toils under handicaps. Gas equipment won't last forever. Mains become rusted, coated, leaky. The greater the number of consumers, the greater the strain upon capacity. New capital depends on special appropriations and there are many other purposes—schools, streets, libraries, fire and police protection always appear to take precedence. Moreover, a municipality can never, I suppose, exploit gas appliances properly. The moment it undertakes to do so, it encounters opposition from merchants—and you can hardly blame a taxpayer for not relishing competition from the town hall.

"The fact that no aggressive merchandising is possible no doubt partly accounts for the unusual lack of sound development of a municipally operated gas plant.

"In addition to all these things there were other circumstances in our case. Alexandria suddenly broke out in a series of growing pains, spread by ordinance to three times its former area, brought upon itself the mystifying problem of how to supply gas to the new residents with the facilities at its command.

"The City Council seized this problem and prepared to dispose of it in a way to satisfy all concerned. As a first move, City Manager Wallace Lawrence estimated the cost of pushing the mains out where they were needed and making necessary improvements at the works.

"It was a robust figure, that total. It was meant to wrestle with an equally robust job. It went before the Council with Lawrence's recommendation that the outlay either be approved or bids for the plant be invited.

"On the City Council are two bank officers, a railway freight agent, a retired manufacturer and a dealer in coal and supplies. These business men decided to call in all the evidence. With perhaps a touch of the same canny shrewdness exercised by some of Alexandria's white-wigged forefathers when engaged in a horse trade, they passed an ordinance agreeing to receive offers but reserving the right to reject them.

"Among the several bids forthcoming was that of the Seaboard Investment Trust. Without dissent, the councilmen voted, 'Aye.' It was the logical thing to do. We could not make returns equal to the interest from proceeds of the sale, plus taxes, plus the saving to citizens because of the lower rate.

"We sold the works, mains and 30-year contract for $750,000 cash. With the plant in private hands, the rate dropped from $1.45 net per thousand cubic feet down to $1.15.

"The heating value jumped from 550 British Thermal Units to 600. The terms of the franchise give the city definite power to regulate the quality of gas and the construction of mains. It provided that, should the company fall below the prescribed B.t.u., the price to consumers will automatically come down at the rate of one cent per thousand for every 10 B.t.u. reduction.

"It was also provided that, within sixty days from the date of the swap —October 1, 1930—service was to be extended to the lately annexed territory. That's what I am inclined to call brandishing a gentlemanly big stick."

Two New Metallurgical Research Projects

FOLLOWING its plan of systematically conducting research in the application of heat in all the important metallurgical fields, the Committee on Industrial Gas Research, F. J. Rutledge, Chairman, has just had contracts signed for two new projects. These two new projects are: "Research in Deterrent Effect of Scale in Gas-fired Furnaces at Heat Treating Temperatures," and Research in Factors Affecting Short Cycle Malleabilizing." These two projects will be conducted for the Committee by the Department of Engineering Research of the University of Michigan, Ann Arbor, Michigan.

The research in the Deterrent Effect of Scale at Heat Treating Temperatures logically follows the research in Scaling at Forging Temperatures, which is nearly complete so far as laboratory work is concerned. Malleabilizing is an entirely new field for gas research.

U. G. I. Broadcasts Company's Policy

WHAT is regarded as one of the most effective pieces of advertising published lately by a utility company appeared on January 2 in the daily newspapers of Philadelphia, Pa., over the signature of John E. Zimmerman, president of the United Gas Improvement Company.

For the information of its readers, the A. G. A. Monthly publishes this statement of "U. G. I. Policy." It follows:

U. G. I. Policy

For nearly fifty years it has been the aim of the U. G. I. to adapt its policies and practices to the best standards of the public utility business.

Our conception of present-day standards is:

1. Effective regulation. The interests of the public and the public utilities are always best served by effective state regulation, and any well-considered measures calculated to strengthen the confidence of the public in the regulation of public utilities will receive our cooperation and support.
2. Rates should be constantly adjusted so as to yield only a fair and reasonable return on the value of the property devoted to the public use. This return should be sufficient at all times to attract new capital and to include a reward for efficient, enlightened and honest management. Economies resulting from efficient management and from mergers, consolidations and interconnections should be shared with the consumer in reduction of rates.
3. Publicity in the financial affairs of a public utility inspires confidence on the part of the stockholder and the public. Public utilities therefore should issue at frequent intervals full statements of their earnings in sufficient detail to give their stockholders a thorough understanding of the affairs of their companies.
4. Holding companies are essential to the expansion and development of public utilities and must not be used to exploit either the consumers or the operating company. Full and complete disclosure should be made of all agreements between the holding company and its subsidiaries covering services rendered by the holding company for financing, managing, purchasing and construction, to insure that they are fair to the consumer, the operating company and the holding company.
5. Government should confine itself to regulation of public utilities and not go into the public utility business. Government should not compete with any of its citizens in any field of business.

THE UNITED GAS IMPROVEMENT COMPANY

John E. Zimmermann,
President.

Gas Engineering Program at University of Michigan

ANNOUNCEMENT of courses in chemical engineering at the University of Michigan, Ann Arbor, Mich., have just been published in a study of the facilities available at that institution.

Professor Alfred H. White, of the department of chemical engineering, is in charge of these courses and in announcing the facilities for the current year he calls particular attention to the "Cooperative Program in Gas Engineering." Particular attention is paid to manufactured gas and the utilization of gas and fuels.

Professor White calls attention to the University of Michigan's fellowship in gas engineering which has been maintained for twenty-eight years. This is believed to be the senior industrial fellowship in the United States.

"A development of the last few years," said Professor White, "has been the demand for men with the highest type of graduate training. Men with the doctorate in chemical engineering are much sought for at salaries so much higher than those which undergraduates receive that it is distinctly worth while for students of ability to continue for their doctor's degree. Some of the graduates from the chemical engineering department," continued Professor White, "start their professional work in the laboratories of the plants by which they are employed, but the majority start in development or process work. During the present academic year there are fifty-one graduate students enrolled in the department of chemical and metallurgical engineering, of whom nineteen already have their master's degree and are working toward the doctorate."

It is claimed that the East Engineering Building at the University of Michigan gives unusual facilities for advanced laboratory work. The department of engineering research has important contacts with the chemical industry and several industrial fellowships will be available for graduate students at the end of this term.

Those interested are invited to write for copies of the bulletin which may be secured upon application to the Chemical Engineering Department, University of Michigan, Ann Arbor, Mich.

Death of Mr. Dibble

CLAUDE M. DIBBLE, vice-president of Moore Brothers Company, Joliet, Ill., died on December 13, in his forty-first year.

A. G. A. Bureau of Standards Field Study of Long Gas Lines*

By SCOTT EWING

Research Associate, American Gas Association, Bureau of Standards

THE recent rapid expansion of the natural gas industry has involved an enormous expenditure for long pipe lines. The question naturally arises as to how the life of these lines can be prolonged, and any information which throws light on this subject is of considerable value to the industry.

Almost all gas and oil companies have some information as to the condition of the lines they operate, which they have obtained either from field inspections or leakage records, or both. Much of this information is not available, but from their own experience most pipe line men have formed opinions as to the value of the various types of coatings. Charles Fitzgerald[1] has indicated that the only place where the enamel coatings are of any value are places where soil stress does not occur, such as continuously wet marshes. He has suggested that the use of enamels be confined to experimental tests. This viewpoint is, of course, strongly opposed by the coating manufacturers, who insist that the soil-stress effect is limited to the heavy soils of the southwest and is not a serious problem in the north and east. Probably the most extensive field study of coatings is that made by Dr. G. N. Scott.[2] He also finds a large percentage of failures, especially with the so-called simple coatings. The writer does not know of any data that have been published to show just what properties of the soil or coating are responsible for this distortion although Dr. Scott and others indicate that it is usually worst in heavy soils, and that it is an inherent characteristic of bituminous materials which are essentially very viscous liquids.

[1] A. P. I. Proceedings, Sec. IV, Jan. 2, 1930, pp. 126-135.

[2] A. P. I. Proceedings, Sec. IV, Jan. 2, 1930, pp. 136-147.

The Subcommittee on Pipe Coatings and Corrosion of the American Gas Association decided that a field study of a long gas line by their Research Associate would be desirable, the object being, primarily, to study the correlation between soil conditions, corrosion and the behavior of protective coatings.

The line which was chosen for the study extending from Amarillo, Texas, to Denver, Colo., appeared to have several advantages. It is one of the longest gas lines and among the first in which the selection of protective coatings was based upon a scientific study of soil conditions. Only parts of the line were coated so that one might be able to determine how effective the coatings were in preventing corrosion. It might also be possible to determine how successful the engineers had been in identifying corrosive soils along the line. The line has been laid for about two years, which should be sufficient time for the effect of the soil on the line to be noted.

II. EXAMINATION OF THE SOILS ALONG THE LINE

1. Method of Mapping

In order to have some method of choosing locations to inspect and to get a picture of the soils along the line, a rough soil chart of the line was made before the inspection work started. This chart is not nearly as detailed and complete as the soil maps that are made by the Bureau of Soils. If all the variations in surface texture were shown, together with all of the soil series, no doubt a very large number of types would be charted. Instead of giving a rough picture of the principal soils along the line this sort of map would be very confusing and would not answer its purpose. Variations in surface texture are of no importance in this particular case, the average texture of the surface 5 feet being the only thing that we need concern ourselves with.

Figure 1 is a chart of the line. In this figure the pipe line has been divided into 6 sections, each 300,000 feet long. Beginning from the southern (Amarillo) end the chart represents the entire line. The right on the chart is always north and each section joins the sections immediately above and below it. The top line of each section indicates the soils along that section of the line, the letters on the chart corresponding to the descriptions which follow. The second line of each section indicates the types of coatings that were applied to the line; the third line of each section indicates the original recommendations that resulted from the soil corrosion survey which was made before the line was laid; the fourth line of each section indicates the author's hypothetical recommendations. In the original survey of the line it was divided into 5 sections, designated by the first 5 letters of the alphabet. The division points between these sections are indicated on the chart.

Each soil "series" has been designated by a capital letter. If there is a sufficient range in texture within the series, it has been divided into a sandy and a clay type, designated by a small "s" and a small "c." A so-called "series" may include a part of some series that has already been described by the Bureau of Soils, or it may include two or more of these series. Wherever the writer feels reasonably certain of the relation of the soils mapped along the line to soils that have been recognized and described by the Bureau of Soils, this relation is pointed out.

2. Soil Descriptions

Series "A" includes soils with a brown or dark brown surface soil which rests upon a light brown sub-soil. The entire profile effervesces when treated with dilute hydrochloric acid, and spots and streaks of lime occur in the deeper subsoil. The lighter textured member of this series corresponds closely with the Prowers Series as mapped in the Arkansas Valley, and has a silty texture. The clay member has a darker surface soil and this dark color extends to greater depth. These soils occupy flat to gently rolling uplands, are well drained and the sandy member does not contain any appreciable alkali. The vegetation consists of prairie grasses and "tube" cactus. This soil occurs on the uplands south of Denver and on the flats between the Huerfano and Apishapa Rivers. The Jimmie Creek bottom is also placed in this series.

Series "B" consists of dark brown to almost black soils, with dark brown sub-soils which extend usually below 6 feet. The profile has a stratified appearance, showing that these soils were recently deposited by streams. They occupy low lying areas along stream channels, they are often wet and have a somewhat mucky appearance in places. The sandy member of this series probably corresponds with the Manvel series of the Arkansas Valley. A little alkali occurs in places in this series. The vegetation consists of wire grass, willows and various weeds. Much of this type is cultivated south of Denver. The clay member of this series, which occurs in a few small areas along the southern half of the line, appears to be an older soil and in a detailed survey would probably not be classed in the Manvel series. The soil in the Arkansas bottom has also been placed in series B, although it does not properly belong to the Manvel series.

Series "C" consists of greyish brown, highly calcareous, heavy, compact clay

* Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

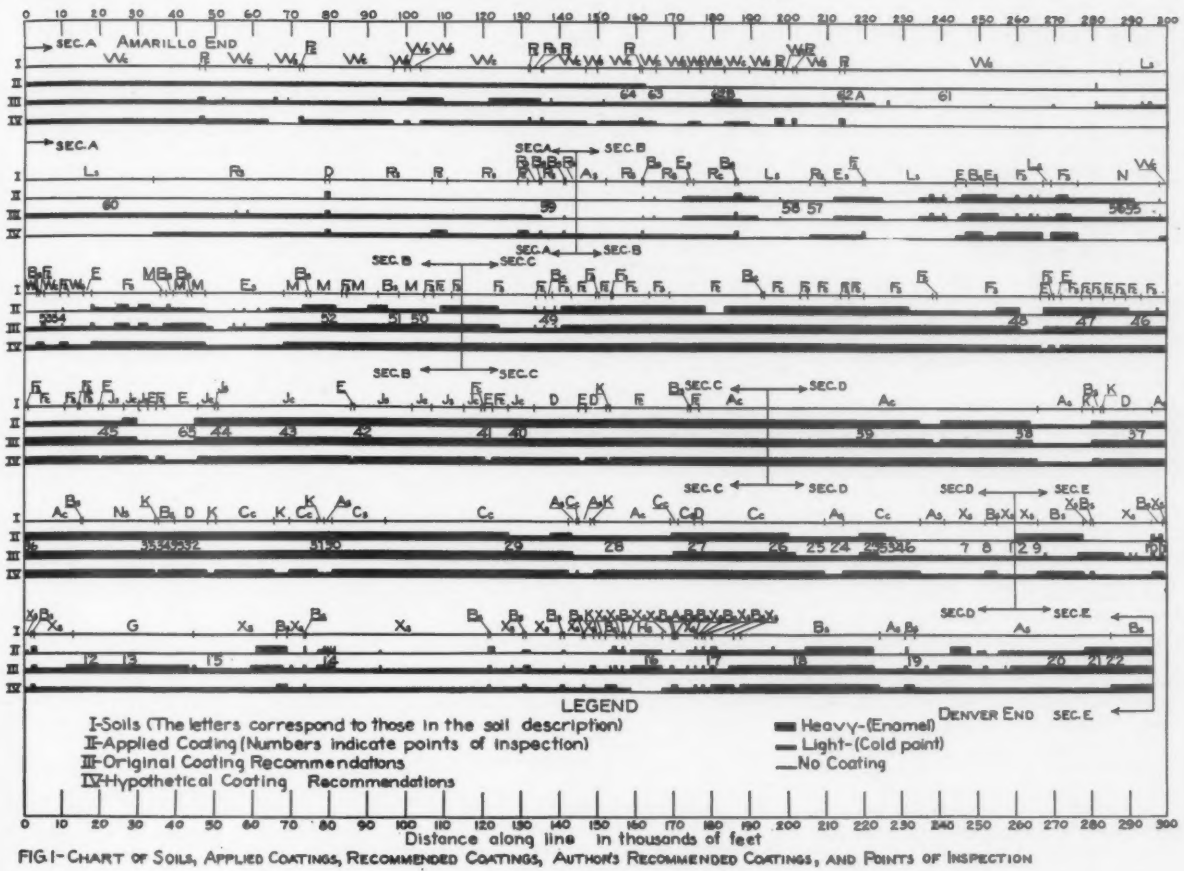


FIG. 1—CHART OF SOILS, APPLIED COATINGS, RECOMMENDED COATINGS, AUTHOR'S RECOMMENDED COATINGS, AND POINTS OF INSPECTION

or clay loam surface soils which rest upon greyish or bluish colored gypsiferous shale (Pierre Shale). The shale usually occurs at about 30 inches. These soils occupy gently rolling areas which are somewhat dissected or scored with stream channels. The soil contains considerable alkali, has fair surface drainage and very poor internal drainage. It corresponds to Ordway Series of Arkansas Valley.

Series "D" are heavy greyish brown soils with an olive drab color when wet. The entire profile has essentially the same color. It is somewhat more compact at about 3 feet. It occupies fans and sloping valleys which lie below shaly uplands. The soil is outwash from these uplands and similar to Series "C" except it does not rest upon shale and so has better internal drainage. It contains considerable alkali and corresponds to Billings and Apishapa Series of Arkansas Valley.

Series "E" occupies steep rocky slopes and high rocky mesas. It includes the high mesa south of the Cimarron River and the Cedar Mesa about 4 miles south of the main line of the Santa Fe Railroad. The soil consists mostly of sandstone with only a little sand or fine sandy loam on the surface. On the Cedar Mesa the sandstone is almost white due to its high lime content. This series would probably be mapped as rough stony land in any detailed soil survey.

Series "F" is a brown or light brown surface soil resting on light brown subsoil with typical coarse granular structure. This is underlain at from 12 to 60 inches by brown stratified sandstone. The topography is billowy to gently rolling with occasional sandstone outcrops. The entire profile is calcareous. In the clay member of this series the soil is darker and sandstone is at greater depth.

Series "G" includes the non-calcareous coarse textured soil in the Black Forest, 15 miles north of Colorado Springs. It consists of a brown, light textured friable surface soil which extends to about 6 inches, underlain by a light brown, very lightly compacted sandy loam. Below this is a somewhat compact, partially cemented gravelly sandy loam. The substratum consists of a very hard, tough, impervious light grey gravelly clay. The vegetation consists of pine trees with a little grass and a few shrubs between the trees. The topography is very uneven and hummocky with V-shaped stream channels and rounded ridges.

Series "H." Only one body of this soil was found, north of the Black Forest. It consists of a very irregular mixture of fine sandy loam and sandy clay with reddish brown to light grey color. General topography rolling and uneven. Vegetation consists of some pine trees, grass, cactus and sage. This series might be split into two or more series in a detailed survey.

Series "J." This series corresponds closely with the series "F," the only distinction being that this soil is underlaid by shaly limestone instead of sandstone. There are numerous fragments of limestone in the soil profile. The heavy textured type corresponds closely with the heavy type of Series "F."

Series "K." Small strips of this soil occur on the slopes down from the uplands occupied by Series "A" and "N." These soils have a light brown surface, containing considerable gravel and are of a gritty silt loam texture. Below this is a highly calcareous rather compact light grey gritty clay loam which merges into beds of sand and gravel. The vegetation consists of a scattered growth of grasses and cacti. This series corresponds to the Fort Lyons Series of the Arkansas Valley.

Series "L" corresponds to the Amarillo soils of Northwestern Texas except that the lime layer as found in the vicinity

of Clayton appears to be much harder than in the typical Amarillo soils so far mapped. These soils have a reddish brown surface layer with a somewhat heavier layer beneath the surface. Carbonates are nearer the surface, but otherwise this series is similar to the Washburn. Only the sandy type of this soil was encountered along the line.

Series "M" includes the red colored soils in Cimarron, Longs and Travesser Canyons. These soils consist of outwash from the red colored calcareous sandstones and shales through which these canyons have been cut. These soils are comparatively young as they show strata of various textures from the surface downward. They are usually calcareous at the surface and contain appreciable amounts of alkali in places.

Series "N" includes upland soils with an open, porous gravel substratum. Only two bodies of this soil were found along the line, one in the irrigated section south of the Arkansas River and the other about two miles south of Guy post office. The surface soil is a light brown to reddish brown sand or fine sandy loam below which is a light brown heavier textured material containing lime spots and fragments. This usually merges into a light grey highly calcareous hard, gritty silt loam at a depth of three to five feet. Below this is a bed of water-worn gravel and cobbles. Vegetation consists of white sage, yucca and grasses. Topography is level to gently rolling.

Series "P" of which only one type, the clay loam, was mapped, corresponds with the Potter clay loam of Northwestern Texas. It has a dark calcareous surface layer, no reddish layer as in the Washburn, and the lime layer is nearer the surface. The surface soil has worm-cast type of structure.

Series "R" corresponds in general to the Reagan soils of Northwestern Texas. This series has a brown, worm-cast surface layer below which is a light colored layer of lime concentration. This soil is similar to the Potter but is somewhat deeper and has a brown instead of a dark colored surface soil.

Series "W" corresponds with the Washburn series as mapped in Northwestern Texas. Two textures have been recognized, the silty clay loam and the sandy types. The series consists of a dark chocolate brown surface soil with a coarse granular structure which is noncalcareous. Below this is a reddish layer, heavier than the surface and always calcareous below 24 inches. This is underlain by a non-indurated, light-colored layer of heavy carbonate concentration which rests upon the parent material.

Series "X" occupies gently rolling uplands on both sides of the Black Forest as far south as Colorado Springs and as far north as Castle Rock. The profile is usually non-calcareous to depth of six feet. The surface soil consists of a dark brown or black fine sandy loam, full of grass roots and extending to depth of about 12 inches. Below this is a light brown or light reddish brown very slightly compact fine sand or sand. The soil is well drained and shows no evidence of alkali. It usually supports a good growth of prairie grasses with occasional white sage and weeds where it has been cultivated. Some of it is now cultivated and will grow wheat without irrigation.

EXAMINATION OF THE LINE

1. Method

With the aid of the soil chart locations to be inspected were chosen which appeared to represent average conditions within each soil series. Several inspections were made in a few of the series, and one can see from a study of Table 1 how much variation occurs within these series.

The points where inspections were to be made were marked with flags and the laborers furnished by the company uncovered the pipe, taking care not to chip off the enamel. The pipe was inspected as soon as possible after it was uncovered.

The following data were obtained at each point of inspection:

List of those present at the inspection.
Location.
Kind of pipe and coating.
Description of the topography, vegetation, surface drainage, internal drainage and soil profile.
Condition of coating and pipe at top, sides and bottom. (If pits were on the pipe their depth was measured with a depth gauge.)
Electrical measurement of resistance of coating if measurement was possible.
A sample of the backfill at the depth of the pipe, and a sample of the enamel off the pipe if it could be obtained reasonably free from soil, were taken.
The pipe was photographed after the soil was cleaned off it, if it appeared that a photograph would indicate anything.

The electrical resistance of the coating, which is given in Column 8 of Table 1 was measured in the following way. A piece of canvas 6 feet long and 3 feet wide was kept in a 10 gallon can containing a weak salt solution. It was removed from the can, folded into a strip 6 feet long and 10 inches wide and wrapped around the coated pipe, care being taken to avoid abrasions on the coating caused by the laborers' tools. If necessary, abrasions on the pipe were repaired with hot enamel before the measurements were made. A piece of bare copper wire was then wrapped around the canvas several times and connected to the terminals of the earth current meter. A contact to the pipe was made by wrapping a chain around it and forcing a small drill bit through the coating to the pipe. The drill bit was connected to the other side of the earth current meter. When the crank on the meter is turned a commutated direct voltage is impressed across the coating. This voltage and the resultant current are measured, and their quotient is the resistance of the coating under the pad. This multiplied by the area of the pipe under the pad gives the resistance of the coating per unit area. This method was suggested to the writer by Mr. W. M. Henderson of the Los Angeles Gas & Electric Corporation through the Chairman of the Committee on Pipe Coatings and Corrosion.

The only source of serious error which the writer can think of in this method is leakage which might occur across the coating to the chain. If such leakage occurred one should find an increase in the resistance of the coating with time, since water would be evaporating from the surface of the coating. However, in practically all cases where two measurements were made, the latter one showed the lower resistance. This was because the water from the pad was penetrating the coating under it and indicates that by far the greater part of the current flowed through the coating. The pad was placed on a bare pipe and gave a resistance of practically zero so that there was no appreciable resistance in any part of the circuit except that interposed by the coating.

Several measurements of the resistance of coating 6[3] were made, and as shown in Table 1, they were all very low even though the coating appeared to be in perfect condition. For this reason it seemed that nothing would be learned from further measurements on this coating and they were not made in the latter inspections. In a few cases the coating was so badly disintegrated that it was off the pipe in places. Had it been possible to get the resistance of the coating before it was uncovered, it would certainly have been very low. In cases of this kind the resistance is marked very low in the table. The blanks in the table indicate that no measurement was made.

[3] The meaning of the letters designating the coatings are given at the bottom of Table 1.

2. Results

(a) *General Condition of the Line.* Anyone with any engineering knowledge would certainly be impressed with the skill and judgment that had been used in avoiding rough topography and corrosive areas in locating the line, while at the same time keeping it almost straight. By noting the kinds of coatings that were used on the line, one sees in general that the heavy coatings were placed where the soil has the appearance of being corrosive and that no coatings were used in soils that appear to be free from alkali and excess water. Although, as is usually the case, there were numerous difficulties to be overcome in constructing and coating the line, the writer is of the opinion, from his inspection of the line, that the coatings were applied in workmanlike manner and with careful supervision. Due to the weather conditions at the time the line was laid it was necessary to add considerable flux in

places, the effect of which will be discussed later.

Over a large part of the line the lower part of the backfill is still loose, just as it was when placed in the trench. The top of the backfill, to a depth of about 1 foot, was slightly compacted, showing that it had been wet to about this depth. In the vicinity of irrigation ditches or low places or places where the backfill has been cut to let surface water cross the trench, the backfill was well compacted and often rather moist.

(b) *Results of Resistance Measurements.* A summary of the more important data obtained from the inspections is given in Table 1. The results of the measurements of electrical resistance of the coatings are given in Column 8. All of the measurements of the resistance of the enamel coatings are surprisingly low, even though the coating appeared to be unaffected. They show that the enamel coating, which is one of the best from an electrical standpoint, does not maintain its non-conducting properties after it has lain underground for two years. Thus measurements are in agreement with numerous electrical laboratory tests of protective coatings which have been made by the Bureau of Standards.[4]

[4] Technologic Paper No. 15, "Surface Insulation of Pipes as a Means of Preventing Electrolysis," and Oil & Gas Journal, May 2, 1929, p. 33.

All of the samples of enamel foamed when they were melted, probably because of the moisture they contain. As the coating becomes distorted the resistance becomes still lower so that there is a general correspondence between the resistance of the enamel coating and its condition, as can be seen from an inspection of Columns 8 and 9 of Table 1.

(c) *Condition of Coating or Pipe at Points of Inspection.* In order to give an adequate picture of the condition of the coating or bare pipe at each location, each inspection has been classified with a letter (Column 9, Table 1 and Fig. 2). These letters have the following meanings:

For bare pipe.

U. Unaffected. Pipe appears to be essentially as it was when buried. May have a thin layer of rust on it but no pits. Mill scale covers almost all of pipe surface.

R. Rusted. Rusted in numerous places but no pits over .020 inch deep. Most of mill scale still on pipe.

C. Corroded. Most of the mill scale gone. Most of the surface corroded but pits usually less than .020 inch deep.

P. Numerous pits over .020 inch deep with depth of deepest pit given. There are always numerous pits only slightly shallower than the deepest one.

For coated pipe:

U. Unaffected. Bond good. Coating on pipe and in good condition. Surface may be roughened due to pressure of sand grains but not distorted.

D. Distorted. Coating roughened and distorted but no visible rust stains on coating. No bare places and no pits on pipe.

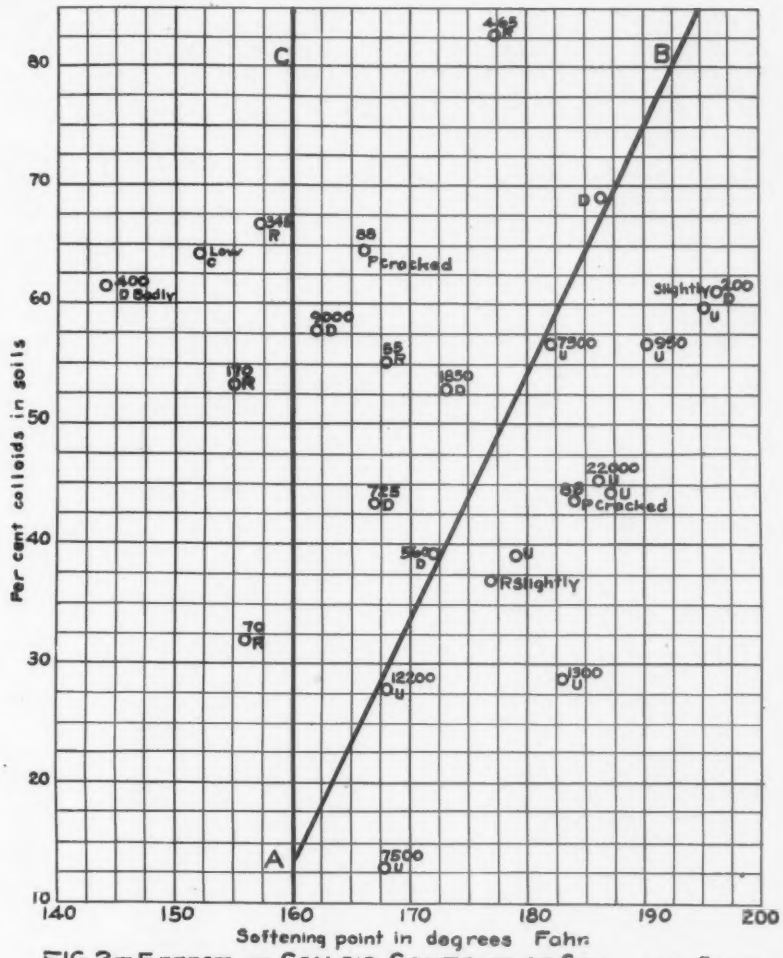


FIG. 2—EFFECT OF COLLOID CONTENT OF SOIL AND SOFTENING POINT OF ENAMEL ON THE CONDITION OF THE ENAMEL

R. Rusted. Rust or bare spots visible which are clearly due to failure of coating after it was covered. Pipe may be pitted slightly but no pits over .020 inch.

C. Corroded. Most of coating and mill scale off pipe surface but no pits over .020 inch.

P. Pitted. Coating failed and pipe has several pits deeper than .020 inch.

In seven of the 21 places where bare pipe was examined the pipe was found pitted or corroded, in seven other places some rusting had occurred and in seven places the pipe was unaffected. In three of the seventeen places where the light coating was examined pitting had occurred and in eight places rusting had occurred. Rusting on a bare pipe without pitting is not particularly serious but rusting on a coated pipe indicates that the coating had failed. Wherever the electrical resistance of the light coatings (b and d) was measured it was low, even though the coatings appeared to be perfect. These coatings were found in all stages of disintegration. Where the soil appeared to be at all corrosive the pipe was rusted and pitted and where the coating was in good condition it is doubtful if bare pipe would have corroded. In the writer's opinion the work on this line has failed to show that either of these cold applied coatings has any marked protective value.

Of the 27 places where the heavy coating was examined, only 3 were found where pitting or serious corrosion had occurred, while in 7 other places some rust was found. When one considers that the heavy coating was applied in the most corrosive soils it is evident that it had retarded the corrosion of the pipe.

In a total of 27 places where the enamel coatings were examined 3 places were found where the pipe was rusted or pitted because the enamel had cracked. These cracks were formed before the pipe was placed in the trench, according to the inspector who was there when the coating

was applied. The cracks formed because the enamel was so hard that it was unable to adjust itself to the sudden temperature changes. Many of the cracks were found to have healed since the pipe was laid, but in the two places where the soil was corrosive, many of the cracks were filled with rust.

There is little doubt that the principal cause of failure of the enamel is the distortion it suffers. In only 11 of the 27 places where the enamel was inspected was it found free from distortion and two of these undistorted coatings had cracked. The worst distortion appeared to be associated with heavy soils and it was worst in practically all cases over the top quarter of the pipe.

LABORATORY TESTS

1. Soil Samples

The specific resistance of the soil was obtained in the laboratory by saturating the soil with distilled water and measuring its resistance in a cup similar to that used by the Bureau of Soils in determining alkali. The resistance, measured by an alternating current bridge, was multiplied by the constant for the cup and corrected to a temperature of 60° F. Hence all of these resistances are comparable and may be considered as a sufficiently accurate measure of alkali content. A resistance of 100 ohms corresponds to an alkali content of about 2 per cent and a resistance of

Table 1
SUMMARY OF INSPECTION DATA

1	2	3	4	5	6	7	8	9	10	11
Inspection Number	*Soil Symbol*	*Specific Resistance of Soil*	*Per cent Colloids*	*Recommended Type of Coating*[1]	*Applied Coating*[2]	*Softening Point of Coating*	*Electrical Resistance of Coating in ohms per sq. ft.*	*Condition of Coating or Pipe*[3]	*Condition of Backfill*[4]	*Remarks*
1	Xs			b	x			R	L	
2	Xs			b	a			U	C	
3	Cc	1660	69.6	b	b		90	R	L	
4	Cc	1230		b	x			P.041	C	Under cut in backfill
5	Cc	402	53.4	b	a	155	170	R	C	Bottom of swail
6	Cc	1670		b	x			R	L	
7	Xs	7910		b	x			R	C	
8	Bs	1710		b	x			R	C	
9	Xs	6400	13.0	b	a	168	75,000	U		Soil moist, top of hill
10	Bs	1125	39.3	a	a	179	too wet	U	C	Low wet place
11	Bs	2190	32.0	b	b		105	U		
12	G	2810		a	x			C	L	Black Forest
13	G	6070		a	x			P.038	L	Black Forest
14	Xs	1770	45.1	a	b		82	U		
15	Xs	2330		b	x			P.048		Near top of ridge
16	H	3690	23.1	a	b		90	R		
17	Bs	1710	28.9	a	a	183	1,300	U		Low wet place
18	Bs	2460	31.6	a	b			R	C	
19	Bs	1500		b	x			R	C	Irrigated alfalfa flo
20	As	1245	55.4	a	b		24	P.040	C	
21	As	1150	57.0	a	a	182	7,500	U		
22	Bs	770	53.0	a	a	173	1,850	D		
23	Cc	722	55.3	a	a	168	55	R	L	
24	As	2750	25.2	b	b		97	U	L	
25	Cc	1810	45.5	b	b		Very low	P.040	C	Under canal
26	Cc	590	61.6	a	a	144	400	D	L	
27	D	361	83.2	a	a	177	465	R	C	
28	Ac	722	44.7	b	d		37	R	L	
29	Cc	438	72.2	a	d		Very low	P.051	C	
30	As	825	45.5	a	a	186	22,000	U	L	
31	K	970	58.0	a	a	162	9,000	D	L	
32	D	438	66.9	a	a	157	345	R	C	Coating cracked and distorted
33	Bs	568	64.6	a	c	166	88	P	C	Checked and cracked
34	Bs	1110	32.4	a	a	176	266	R	slight	No distortion
	This inspection omitted in later tables, age 1 yr.									
35	K	2500	17.9	a	c	168	12,200	U	C	Cracked, no distortion
36	Ac	381	39.4	a	c	172	560	D	L	
37	D	105	55.4	a	a		Very low	R	C	Trench wet
38	Ac	1110	43.6	a	a	167	725	D	L	
39	Ac	233	32.0	a	a	156	70	R	L	
40	Jc	1000	57.1	a	a	190	950	U	C	Ctg. checked
41	E	1900	44.7	a	a	187		U		Chipped when backfilled
42	Js	690	61.6	a	a	196	200	D	L	
43	Jc	530	60.6	a	a	195		U	C	
44	Jc	690	69.4	a	a	186		D	C	
45	Js	722	47.6	a	b			U		
46	Fc	595		a	b			U	L	
47	Fc	1160	64.4	a	a	152	Very low	C	C	Worst place on line
48	Fs	830	37.2	a	a	177		R		Only slight rust
49	Bc	1160	74.8	b	b			R	C	Low flat
50	M	1260	56.6	a	b			R	C	
51	Bs	1095	55.2	a	b			R	C	
52	M	453	44.0	a	a	184	88	P.020	C	
53	Wc	1440		b	x			R	L	
54	Wc	2330		b	x			U	L	
55	Ns	2890		b	x			U	L	
56	Ns	4920	23.6	b	b			R	C	
57	Rs	2430		x	x			U	L	
58	Ls	3410		x	x			U	L	
59	Rs	3015		x	x			U	C	
60	Ls	2630		b	x			U	L	
61	Ws	3400		x	x			P.028	C	Only few pits
62A	Pc	2420		a	x			P.031	C	Low, water near hole
62B	Ws	2740		a	x			U	L	
63	Wc	2190		b	x			R	C	
64	Wc	875	55.0	b	d			D	L	
65	E	2850		b	x			P.044	C	

[1]x—no coating, a—heavy (enamel), b—light coating (cut-back).
[2]x—no coating, a—Bitumastic enamel, b—Bitumastic No. 4, c—Biturne enamel, d—Arco Sav-a-line containing asbestos fiber.
[3]U—unaffected, D—distorted, R—rusted, C—corroded and P—pitted.
[4]L—loose, has never been wet, C—compacted, has been wet since line was laid.

500 ohms corresponds to an alkali content of 3 per cent for a clay soil. The alkali content is considered by some as a rough measure of soil corrosiveness. The results of these measurements are given in Column 3 of Table I.

The colloidal content of the soil was estimated by the Bouyoucos method (Soil Science Vol. 23, No. 4, 1927). It was necessary to wash the alkali out of many of the samples, and instead of potassium hydroxide, sodium oxalate was used as a dispersing agent. The results of these measurements are given in Column 4 of Table I.

2. Enamel Samples

The softening point (Ball & Ring method) of the coating material scraped off the pipe is given in Column 7. All of these determinations were made in glycerine so that they might be comparable with each other. Now that they are done one can see that they might have been determined in water, which would probably have increased their precision. Where there was a sufficiently large sample the hardness of the material was determined with the Abraham's Consistometer. As one might expect, a rough linear relation was found to exist between these two quantities, so that one is justified in saying that the softening point is a rough measure of hardness for this material.

3. Relation of Properties of the Soil and Coating to Coating Behavior

The distortion phenomena which were observed on this line can all be explained in the following way. Distortion is caused by uneven pressure of the backfill. Light textured or sandy soils show no distortion because they do not form clods and hence exert a uniform pressure on the coating surface. Heavy soils form hard fragments which press on the coating only in places so that the coating yields and flows away from the clods.

If this supposition is true one should be able to relate the observed distortion with the tendency of the soil to form hard clods. A rough measure of this property of the soil is its colloidal content, and the hydrometer method is a rapid method of estimating colloidal content. The coating had various amounts of flux added to it to prevent cracking, so that its hardness varies and it is probable that the harder the coating, the less it will be distorted. We thus have the following quantities which are inter-related: The softening point of the coating material, the colloidal content of the soil and the distortion of the coating. In Fig. 2 the relation between these quantities is shown. The colloidal content of the soil and the softening point of the coating are plotted on the two axes. These two quantities are not functions of each other because a coating with any melting point may occur in a soil with any colloidal content and a point representing an observation may occur anywhere between the two axes. All observations where these quantities are known are plotted in the figure. A letter representing the condition of the coating is placed near each point. These letters correspond to those in Column 9 of Table I. The figures near each point are the resistances of the coating taken from Column 8 of Table 1. One observes a decided grouping of the letters and a rough grouping of the resistances. All of the points which represent an unaffected coating lie to the right of the line AB. In the one case to the right of AB where the pipe is pitted the failure was caused by cracking and not distortion. In the wedge shaped area BAC there is some rusting but most of the points show only distortion. All of the points to the left of AC, representing softening points below 160° were rusted or corroded, except one and the distortion here was very bad so that the coating is probably on the verge of failure.

There are not a sufficient number of points to determine with any precision the positions of the lines separating the three areas. But if one assumes that the lines are the true boundaries, one can state definitely what conditions must be satisfied to prevent distortion. One should never let the softening point get below 160° F. For any soil the softening point should not be below $152° + C/2$ where C is the colloidal content as determined by the hydrometer method. It is not known whether in some other region, there may be other factors which enter the problem such as the soil or pipe temperature, the seasonal distribution and amount of rainfall, the depth of the pipe and perhaps its diameter. Therefore, in practice, to obtain the best coating one should try to use enamel as hard as possible and permit it to be softened only sufficient to get the pipe lowered and covered without serious cracking.

V. THE EFFECTIVENESS OF THE SOIL CORROSION SURVEY

It is a matter of considerable interest to try to determine how well the condition of the line corresponds with the recommendations made in the corrosion survey. The data in Table 1 are rearranged in Table 2 to show the distribution of the various conditions found with regard to the original recommendations. The coating recommendation given in Column 5 was taken from the report of the chemists who analyzed the soil samples along the line.

By an examination of the table it will become evident how the inspections were classified in the last three columns of the table. It is debatable whether this classification of the inspections is a fair one, but the question is beside the point as will be seen later.

With the knowledge we now have of the causes of the corrosion of pipe lines it is easy to show that the corrosive soils can be located with much less effort than was expended on this line. The soil chart (Fig. 1) of the line was made without any reference to anything except a field examination of the soils along the line and the geological and soil survey reports of areas through which the line passes. By studying the figure one notices that protection was recommended in certain soils and not in others. If we examine Table 1 and group the soils on the basis of the resistivity of the samples we might arrange them as follows:

Group 1. Above 3000 ohms, W_s, L_s, G, H, N
Group 2. 2000-3000 ohms, X_s, R_s, P_c, E, W_c
Group 3. 1000-2000 ohms, A_s, B_s, B_c, K
Group 4. 500-1000 ohms, A_c, C_c, F_s, F_c, J_s, J_c
Group 5. Below 500 ohms, D, M.

Of course, in an actual survey of this kind one would take many more samples in each type so that one would be much more certain of the range in resistivity of each type. But even with the few samples taken in this case the distinction between the various groups is sufficiently marked.

On the basis of their low topographic position we would place B_s, B_c and P_c in Group 5. Soil N where it is irrigated south of the Arkansas River should also be placed in Group 5. Its high position, its timber cover and the lack of lime in the entire profile leads one to suspect that soil G might be an acid soil. Laboratory measurement of its pH showed that it was slightly acid and it is therefore placed in Group 3.

Now we will put no coating on Group 1, light coating on Groups 2 and 3, and heavy coating on Groups 4 and 5. The three types of coatings would then be distributed on the various soils in the following way:

Bare H, L_s, N (where not irrigated), W_s

Table 2
CORRECTNESS OF ORIGINAL RECOMMENDATIONS

Coating		*Condition of Pipe*					*Success of Recommendation*		
Recommended	*Applied*	*U*	*D*	*R*	*C*	*P*	*Right*	*Wrong*	*Indefinite*
none	none	3				1	3	1	
none	light								
none	heavy								
light	none	3		7		3	10	3	
light	light	2	1	4		1		5	3
light	heavy	2		1				1	
heavy	none	1			1	2	3	1	
heavy	light	3		4		2	6	3	
heavy	heavy	8	7	6	1	2	16		
					Totals =		38	14	13
					Per cent right = 73.1				

Light A_s, E, G, K, R_s, W_c and X_s
Heavy A_c, B_s, B_c, C_c, D, F_s, F_c, J_s, J_c, M, N
(where irrigated) and P_c

We designate these recommendations as the hypothetical recommendations. The distribution of the coatings with this scheme is shown in Fig. 1. Analyzing the results in exactly the same way as was done with Table 2, we make Table 3.

Table 3
CORRECTNESS OF HYPOTHETICAL RECOMMENDATIONS

Coating		*Condition of Pipe*					*Success of Recommendation*		
Recommended	*Applied*	*U*	*D*	*R*	*C*	*P*	*Right*	*Wrong*	*Indefinite*
none	none	4				1	4	1	
none	light			2				2	
none	heavy								
light	none	3		4	1	3	8	3	
light	light	2	1			1		1	3
light	heavy	6	1						7
heavy	none			3		2	2	3	3
heavy	light	3		6		2	8	3	
heavy	heavy	4	6	7	1	2	16		4
					Totals =		38	10	17
					Per cent right = 79.3				

Any other method of classification may be used to determine the per cent of the recommendations that are right, but if both the original and hypothetical recommendations are treated in the same way, the percentage of correct recommendations in each will be about the same. This must necessarily be so because the original and hypothetical recommendations do not differ greatly. If one wished to get accurate information as to the comparative correctness of the two sets of recommendations, he should choose a large number of points for inspection where the recommendations differ.

It should be borne in mind by the reader that the hypothetical recommendations are based upon only (1) the soil chart of the line which was made in approximately two weeks by two men and (2) soil resistivity measurements which were made in two days and calculated and corrected in one day by one man. If the line were not laid it would require considerable more time to make the soil chart than it did in this case because the position of the line would not be so evident. Neither would there be backfill to examine, and consequently the nature of the subsoil could not be determined without making holes. When the holes were made alkali samples could be collected so this would involve little additional work. It would also be necessary to make many more resistivity determinations in order to be more certain of the alkali conditions.

On the other hand there would probably be at least a few available soil maps and reports of areas through which the line passed and they would be of considerable help in mapping the soils.

There are a few places such as the point at inspection number 16 in Section E where the hypothetical recommendations are certainly wrong and where the soils are not mapped in a satisfactory way. None of these obvious mistakes have been corrected in the comparison of the methods, although some of them might have been avoided if the map had been made with more care and if more samples had been taken and tested.

There is one way in which the comparison may not be entirely fair. The soil samples which were used to group the various soils according to their resistivities were taken at the points where the line was examined while the samples upon which the original recommendations were made were taken at other points. The writer believes this difference is of no importance but he has no way of proving it.

VI. SUMMARY AND ACKNOWLEDGMENTS

The data fail to indicate that coatings b or d have any protective value. Coating b was found in all stages of disintegration. Where it was in good shape it is doubtful if bare pipe would corrode, and where the soil was corrosive the pipe was pitted. Coating d was examined in only three places, which is not sufficient for a positive conclusion. There does not appear to be any relation between the resistance of these coatings and their condition, the resistance being very low wherever it was measured. The condition of these coatings does not appear to be related to either the colloidal content of the soil or its specific resistance when saturated.

The results of this study indicate that if an enamel is used as a pipe coating it should be hard, because the harder the enamel the better it resists soil action. The only limit to hardness is the tendency of the enamel to crack. A much harder enamel can be used in warm weather so it is a decided advantage to apply it then.

There is a fair correlation between the soil types in Fig. 1 and the recommendations resulting from the corrosion survey. In order to make coating recommendations in this region as accurate as those made for this line the following procedure is sufficient: (1) Make a soil map of the line and (2) measure the resistivity of a number of soil samples, taken with proper care along the line.

This work was made possible through the cooperation of Ford, Bacon & Davis, Inc., and the Interstate Gas Company. These organizations furnished all labor and transportation and the assistance of Dean Marshall. It would have been quite impossible to collect this information and data without his knowledge of the line and the coatings that were applied to it.

The writer is indebted to E. H. Templin of the Texas Agricultural Experiment Station for his help in mapping and identifying the soils in Texas.

Oklahoma Construction Continues Active

AN active new construction program has been planned by natural gas companies operating in Oklahoma for the present year. A preliminary survey made by the Oklahoma Utilities Association indicates that approximately $8,000,000 will be expended by such companies for new construction and betterments during the year. The survey does not cover projects of new companies during the year, but was based upon letters and telegrams received from companies already operating in the state. Expenditures of even a greater sum during the year are therefore probable.

Approximately 600 miles of new gas transmission lines, ranging from 4 to 22 inches in diameter, were laid in Oklahoma during 1930, not including thousands of miles of smaller pipe laid for gathering and distribution lines. Thirty-seven Oklahoma towns granted franchises or contracts to natural gas companies during the year. Most of these are towns which had never before had gas service. Natural gas distribution systems were completed and service installed for the first time during 1930 in 24 Oklahoma towns.

New pipe line construction projects included three large interstate pipe lines extending from the Texas panhandle gas fields across northwestern Oklahoma to cities and towns in Kansas, Nebraska, Iowa, Missouri, Illinois, Indiana and other states.

The Ohio Gas and Oil Men's Association

SECRETARY William H. Thompson has announced the convention of the Ohio Gas and Oil Men's Association will be held March 17 and 18 at the Deshler-Wallick Hotel in Columbus, Ohio. The program is being developed and will be announced at an early date.

Free Gas for Poor

NO deserving or needy family residing in cities or towns served by the Oklahoma Natural Gas Corporation will need to live in an unheated home during the present winter. Officials of the company have announced that free gas service will be supplied to all families without funds to pay, or extensions of time will be granted for payment of bills. The company limits its offer of free gas to such persons as may be designated by charity or community fund organizations as being in need of the service.

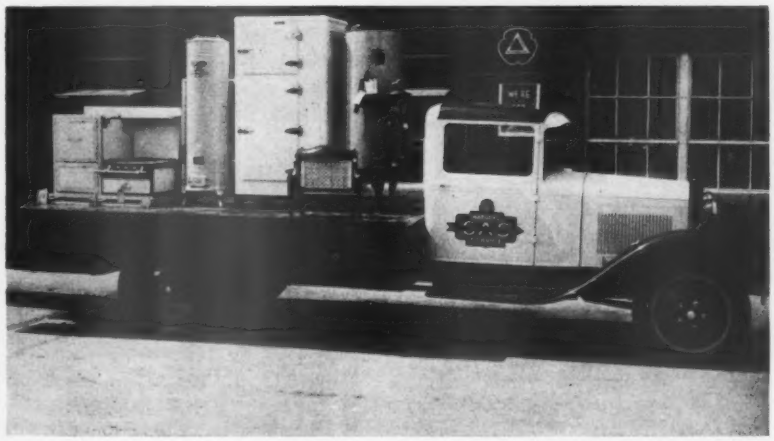
Flood Lighting Adds to Safety at Night

IN an effort to promote safety and facilitate night work, the distribution department of the Consolidated Gas Company of New York has developed a unique method of flood lighting for locations where work is carried on after dark.

The equipment, shown in the accompanying photograph, consists of seven-foot lighting standards, upon which are placed three 100-watt red lamps, and one 100-watt frosted lamp. There is, in addition, a 50-watt white lamp on a 25-foot extension cord. Current is secured from the nearest New York Edison Company lamp post.

The use of three red, one white, and one extension lamp is standard practice for the smaller distribution jobs. When the street opening is a large one, it is necessary to provide additional lamps.

New Business Truck



ABOVE is a picture of a "new business appliance truck" used by the Southern Cities Distributing Company, Shreveport, La. It is seven feet wide and twelve feet long, made of one-inch oak boards amply re-enforced with an inch-and-a-half strip of angle iron around the edge to prevent the appliances from sliding off. There are two all steel fittings boxes on either side of the truck which contain several small compartments for carrying the various sized fittings. There is also a steel locker underneath the rear of the truck to carry a tarpaulin for use in stormy weather, tools, vices and other miscellaneous equipment. A heavy two-inch skid board is carried on rollers just underneath the body.

The Application of Heat to Core Baking

A NEW illustrated booklet, The Application of Heat to Core Baking, has just been published by the Committee on Industrial Gas Research of the American Gas Association, of which F. J. Rutledge is Chairman. The booklet is the work of H. L. Campbell, Associate Professor of Metallurgical Engineering, University of Michigan.

Professor Campbell's research in measuring the effect on the strength and other properties of foundry cores of convected heat as compared with radiated heat, and his previous researches in measuring the physical characteristics of cores and core binders, has served as a basis for the text. The subject matter has been carried from this point to a discussion of materials used in making satisfactory cores, especially core binders. Good foundry practices relative to core ovens are emphasized and explained.

The book is well illustrated showing in detail how foundry cores are mixed, baked and tested and in addition the various types of ovens most suitable for meeting the conditions found in both large and small foundries are shown.

The Application of Heat to Core Baking is available at a nominal charge at American Gas Association, 420 Lexington Avenue, New York, N. Y.

New Bibliography Soon Available

THE second bibliography of articles on industrial uses of gas will be available shortly and mailed to members registered in the Industrial Gas Section. The first issue of this bibliography appeared early in 1930.

Measured by the liberal use which members have made of the files at headquarters and by the large demand for photostatic copies of the material listed, the bibliography has been of considerable value to industrial gas men.

Louis C. Smith is Named Assistant to Managing Director

LOUIS C. SMITH, formerly vice-president and division manager of the New York Power and Light Corporation, on January 1, joined the headquarters staff of American Gas Association as assistant to the managing director. In announcing this appointment, Alexander Forward, managing director of the association, said that Mr. Smith brought to his new work many years' experience as a public utility operator.

L. C. Smith

Entering the employ of the Philadelphia Gas Works, Philadelphia, Pa., Mr. Forward said, Mr. Smith, shortly after his graduation from the Mechanical Engineering Department of the University of Pennsylvania, spent three years in distribution work in Philadelphia, becoming an assistant superintendent.

Mr. Smith's early experience in gas production was obtained in experimental work at the Point Breeze Plant.

During a long connection with the United Gas Improvement Company he had charge of the inventory and appraisal of the distribution system of the Omaha Gas Company, and became engineer, then manager of the Fulton County Gas and Electric Company.

In 1925, when the Mohawk Hudson System was developed, Mr. Smith became president of the Fulton County Gas and Electric Company in charge of all its operations.

In 1927 he was made a vice-president and division manager of the New York Power and Light Corporation and for the past several years acted in that capacity handling operations in the Mohawk and Schenectady divisions.

Boston Consolidated Sponsors Gas Appliance Exhibit

EXECUTIVES, members of the sales staff and other personnel, as well as representatives of manufacturers, attended a series of gas appliance exhibits and meetings the latter part of December in the auditorium of the Boston Consolidated Gas Company, Boston, Mass. The exhibit was open to the general public all day January 2.

The exhibit and meetings were sponsored by the sales department of the company in the interests of better understanding of the mechanical and efficiency features of manufacturers' products and of the customer's point of view.

The meetings opened with a talk, "This Meeting and Exhibit," by Frank D. Cadwallader, vice-president in charge of sales, after which H. J. Long, president of the Kompak Company, New Brunswick, N. J., discussed "Hot Water Service," and Raymond Booth, of the Standard Gas Equipment Corporation, explained technical points regarding gas ranges and modern cooking.

Opening with a talk on "The Commercial and Industrial Uses of Gas," by L. B. Crossman, head of the industrial gas department, the second day's session continued with a description of the gas house-heating field and the work it has accomplished, by C. H. O'Donnell, head of the house-heating department.

Gas refrigeration, customers' service work, home service, and publicity were among the remaining subjects on the afternoon program, which was concluded with a dinner to the customers' service department, at which Walter C. Beckjord, vice-president and general manager of the company, addressed the group present on "The Value of Employee Cooperation."

The meetings closed with an address by Dana D. Barnum, president of the company. Mr. Barnum's message to those present followed talks by J. C. Aaron, of the Glenwood Range Company, F. D. Cadwallader, and J. J. Quinn, assistant to Mr. Cadwallader.

McCarter Medal Awards

Three McCarter Medals, awarded by the American Gas Association, were presented to John Murphy, Arthur G. Collins and Thomas E. Mullen, and a certificate of merit was given Thomas Cannon, all employees of the Koppers Construction Company, of Brooklyn, N. Y., at a dinner held on December 9, 1930.

J. Murphy

A. G. Collins

This dinner was attended by all of the plant general foremen and representatives of the management. The men of one shift of the ovens department were present as honorary guests in recognition of the fact that they had completed more than two years without a lost-time accident.

T. E. Mullen

Dan M. Rugg, Koppers plant manager, made the awards after briefly describing the conditions relative to the asphyxiation and resuscitation of the victims saved by Messrs. Murphy, Collins and Mullen. As each man went forward to receive his award the citation was read and applause followed.

Patrick Goodman Passes Away

PATRICK GOODMAN, owner of the Safety Gas Main Stopper Co., Brooklyn, N. Y., and a member for many years of the Natural Gas Association of America and the American Gas Association, died January 5.

Bulletin of Abstracts is Discontinued

BECAUSE of the steady decline in circulation, the bi-monthly, *Bulletin of Abstracts*, published by the American Gas Association and one of its predecessor organizations for more than 35 years, has been discontinued, according to announcement made by Alexander Forward, managing director of the Association. The last issue distributed was No. 6, vol. 24 (November, 1930).

Careful study of all information relating to the *Bulletin of Abstracts* was made and it was determined to stop its publication. For a long while, the Association has been sustaining a loss by issuing this work. It was felt by members of the Executive Board that there are other sources of information available to members and, inasmuch as the service has been rendered at a loss, that the organization's energies and resources can be expended to better advantage in other directions.

However, the Association is engaged in studying a service being offered by another national organization and, if it is found advisable, this service may be substituted for the *Bulletin of Abstracts*.

Portland Gas Show Wins Dealers

In order to interest the dealers of Portland, Oregon, an exposition was held recently in the display rooms of the Portland Gas & Coke Co. and space furnished free to each department store or furniture dealer to display a model kitchen, featuring a modern gas range. An attractive young woman was in charge of each booth.

The company offered cash prizes for the three best displays. In order to get the public interested, ballots were issued to all who visited the exposition to vote their choice.

In order not to deprive the company's salesmen of the benefit of a display and to encourage them to work with the dealers, arrangements were made with the dealers, allowing them to pay the salesmen a certain commission on prospects and on sales closed. The effort was so successful with fourteen dealers participating, that instead of one week, the exhibit was carried over for more than two weeks. It created more enthusiasm on the part of the dealers to sell gas ranges instead of electric ranges, as has been their custom.

They realized that it was not necessary to sell cheap gas ranges, nor was there more profit in the electric range on account of its higher retail price, because they found it was possible to sell up-to-date gas ranges for even more money than electric ranges could be bought for, which was a revelation to many of them.

A. G. A. Headquarters Enters Basketball

The A. G. A. Basketball Team. From left to right, they are C. Weltri (captain), forward; J. Krappe, guard; Joe Aiello, forward; Tim Malloy, guard, and Frank Yuda, center

NEW YORK courts this year have welcomed a new aggregation—the American Gas Association Basketball Team whose members have been drawn from the junior members of the headquarters staff.

Under the leadership of C. Weltri as captain, the A. G. A. Team made its debut last fall and since that time has been playing regularly at the City Gymnasium, in 54th Street, New York.

Last month, the A. G. A. Team entered upon a series of games with other local teams.

Members of the team are as follows:

C. Weltri (captain) forward; J. Krappe, guard; Joe Aiello, forward; Tim Malloy, guard, and Frank Yuda, center.

Laboratory Staff Increased

DURING December three new engineers joined the staff of the A. G. A. Testing Laboratory at Cleveland, O., F. H. Roninger, Jr., H. J. Hill, and F. O. Suffron. Mr. Suffron, recently connected with the Washington Gas and Electric Company, Tacoma, Washington, and a distribution engineer of broad experience, will be connected with the pipe joint research investigation. He has been actively connected with the gas business in various capacities for the past twelve years. During this time he assisted in the preparation of the Pacific Gas Association Hand Book, and served as a member of the Committee on Leakage Elimination for the Pacific Coast Gas Association.

All of the research activities at the Laboratory were consolidated on January 1, in anticipation of future growth and development in this field. K. R. Knapp, has been made chief engineer, and John Corsiglia, assistant chief engineer, in charge of these activities. Mr. Knapp has been in charge of the pipe joint research investigation at the Laboratory for 18 months. Mr. Corsiglia has been connected with the Laboratory since its inception and is thoroughly familiar with its activities.

Personal and Otherwise

W. E. Jominy

Walter E. Jominy, research engineer in charge of the American Gas Association metallurgical projects at the University of Michigan, has resigned to become a member of the research staff of the A. O. Smith Corporation, Milwaukee, Wisconsin. He entered upon his new duties January 15.

Mr. Jominy has carried many important investigations for the Committee on Industrial Gas Research. These include metallurgical studies in the application of gas to forging, heat treating and short cycle malleablizing. He has just finished some original and valuable work in the effect of atmospheres on the decarburization of steel at heat-treating temperatures, which will be ready for publication at an early date.

Probably Mr. Jominy's most important contributions to the gas industry were his findings on the relative importance, from the heating standpoint, of over-heating, burning, decarburizing and scaling of steel forgings. Competent authorities state that his conclusions on these subjects will serve as a basis for the advanced design of gas forges for many years to come.

Most of the steel research work that Mr. Jominy has done for the Committee on Industrial Gas Research has been presented to industry through the American Society for Steel Treating and the technical press. This has given him a standing as one of the leading forging experts of the country. Prior to undertaking research work for the A. G. A. he had extensive experience in metallurgical work in the automobile industry with Packard, Ford and Studebaker.

H. V. Armstrong, manager of the Sioux Falls Gas Company, has taken over the duties of manager of a group of gas plants in Ohio, Illinois, Indiana and Kentucky. Mr. Armstrong also will be vice-president of the Gas Utilities Group, a subsidiary of the Associated Gas & Electric Company system.

Richard E. Pierce has been named manager of the Northampton Gas Light Company, the Northampton Electric Lighting Company and the Mill River Electric Light Company to succeed the late Eugene B. Edwards.

Harry W. Baker, district manager of the Ohio Fuel Gas Company, Cambridge, Ohio, was chosen president of the Chamber of Commerce in that City.

George B. Austin, formerly treasurer of the Newport Gas Light Company, was recently elected vice-president when that concern passed into control of the American Electric Power Corporation. J. C. Forsythe was elected secretary of the company.

A. M. Frost, formerly general sales manager of the North American Company subsidiaries, now is associated with the general sales department of the Pacific Gas and Electric Company, San Francisco, Calif.

G. H. Cummings has been appointed sales research assistant of the Public Service Company of Northern Illinois, Chicago, which is a newly created position.

Dr. Robert C. Williams, who has been engaged in industrial research with one of the large rubber companies for the past two years, has been appointed a member of the technical staff of Battelle Memorial Institute.

Jesse R. Stetser, New York representative of Roberts & Mander Stove Co. in the Metropolitan District of New York, was elected a member of the board of directors by the stockholders to show their appreciation of his work.

Halfdan Lee has been appointed president of the Massachusetts Gas Companies to succeed James L. Richards, who retired January 1 after twenty-eight years in office. Mr. Richards will serve as chairman of the board of that organization.

George W. Loeffel has been appointed manager of the house-heating department of the Birmingham Gas Company, Birmingham, Ala.

Philip J. Martell recently announced his resignation as manager for East Tennessee of the East Tennessee Gas Company, Maryville, Tenn.

George H. Howard, president of the United Corporation, has been elected a director of Public Service Corporation of New Jersey. Mr. Howard succeeds Samuel T. Bodine, who was one of the original directors of Public Service.

J. H. Sumner has been named director of public relations for both the Cambridge Gas Company and the Cambridge Electric Light Company.

J. W. McElderry has been appointed assistant to E. J. Stern, manager of the eastern division of the Southern Natural Gas Corp. Mr. McElderry was formerly manager of the Columbus division of the Mississippi Service Company.

D. S. McManus, for the past six years superintendent of gas, water and buses of the Gulf State Utilities Company and the Louisiana Electric Company at Lake Charles, has been appointed division manager of the Southwest Louisiana Division of the United Gas Distribution Company, a unit of the United Gas System.

W. Re. Brown, former new business manager of the Ohio Fuel Gas Company, and known to most natural gas men because of his special work with the Natural Gas Association of America and as editor of *Natural Gas,* now is representing the Lee B. Mettler Company in Southwestern natural gas territory.

W. P. Yant, of East Sparta, Ohio, has been appointed supervising engineer of the Pittsburgh Experiment Station of the United States Bureau of Mines, Department of Commerce, it was announced last month by Scott Turner, Director of the Bureau. Mr. Yant succeeds G. St. J. Perrott, who has accepted a position on the research staff of the A. O. Smith Corporation, Milwaukee, Wisconsin.

Fred C. Hill has been named superintendent of gas control for the Hudson Valley Fuel Corp., Troy, N. Y.

Discovering the Home

CLIFFORD E. PAIGE, vice-president of the Brooklyn Union Gas Company, has made one of the most significant discoveries of the day. From the records of his company it seems that people are staying at home more than formerly!

"How we were transformed from a nation of front-porch sitters into one of gadabouts is one of the most astonishing chapters in New World history. The automobile did it, of course. And there are many other great changes that may be charged to the automobile.

"It has led to wider scattering of homes—which means more homes. At the same time there have been developed many diversions calculated to keep the people away from the homes much of the time. If Mr. Paige is right, a reaction has set in.

"He is probably right. One good thing about automobiles is that they can be used by people to get home. And with the radio and other home attractions to be had there, there is a growing inclination to stay at home.

"It seems certain that in the future, with television, as well as radio; with improved means of communication, with more comfortable homes, with more leisure, better automobiles and flying machines, the home will come back into its own as a center of family and social life."—*Editorial from the Brooklyn Daily Eagle*

Affiliated Association Activities

Oklahoma Utilities Association

THE Oklahoma Utilities Association will hold its 13th annual convention at Oklahoma City, March 10 and 11. The business sessions will be held at the Huckins Hotel. The convention will consist of a general session to be held on the morning of March 10 with division meetings in the afternoon and all the day following. Night meetings will be held on both dates. During the convention a McCarter Medal awarded to W. A. Beam, of Tulsa, will be presented.

Speakers of national prominence in the several branches of the utility industry will feature the program with attractive entertainment features interspersed. The evening session on March 11 will be featured by Oklahoma state preliminaries in the National Public Speaking Contest sponsored by the National Electric Light Association and by competitions between first aid teams representing the larger companies in the Association membership, with team and individual prizes for the winning teams.

An exhibit by manufacturers of appliances will be held in connection with the convention.

The Oklahoma association convention program is built around the idea of bringing to the rank and file of the organizations constituting the association membership, who do not have the opportunity of attending national conventions, as many features as possible which have been or are worthy of being offered at the national conventions and a remarkable degree of success has attended this effort in the past. It is promised that the same high standard will mark the programs this year.

Problems concerning the electric, gas, telephone and electric railway branches of the utility industry will furnish material for the division programs.

Officers of the association are as follows: President, T. H. Steffens, president Sand Springs Railway Co., Sand Springs, Okla.; first vice-president, S. I. McElhoes, vice-president Southwestern Light & Power Co., Oklahoma City; second vice-president, R. J. Benzel, general manager Southwestern Bell Telephone Company, Oklahoma City; treasurer, W. R. Emerson, secretary-treasurer Oklahoma Gas & Electric Co., Oklahoma City; manager, Edw. F. McKay, Oklahoma City.

New Jersey Gas Association

THE 1931 convention of the New Jersey Gas Association will be held at the Hotel Stacy Trent, Trenton, New Jersey, on Friday, March 27.

Chester Grey, president of the association, announces that plans are nearing completion for an interesting and instructive program. More than 500 gas men, representing all branches of the industry, are expected to attend this one-day annual meeting. Nationally known leaders throughout the gas industry will participate in a program of timely subjects, of both general and specific appeal. The final program will be announced at an early date.

Illinois Gas Association

THE annual convention of the Illinois Gas Association will be held in Springfield, March 12 and 13.

B. J. Mullaney, vice-president of The

Convention Calendar

New England Gas Association,
Statler Hotel,
Boston, Mass.
February 3, 4, and 5.

A. G. A. Mid-West Sales Conference,
Sherman Hotel,
Chicago, Ill.
February 12 and 13.

Pacific Coast Gas Association, Accounting Section Conference,
Los Angeles, Calif.
February 24 and 25.

A. G. A. Eastern Natural Gas Sales Conference,
Hotel Shenley,
Pittsburgh, Pa.
February 26 and 27.

Pacific Coast Gas Association, Technical Section Conference,
Los Angeles, Calif.
March 5 and 6.

Oklahoma Utilities Association,
Oklahoma City, Okla.
March 10 and 11.

Illinois Gas Association,
Springfield, Ill.
March 12, 13.

National Home Service Conference,
Edgewater Beach Hotel,
Chicago, Ill.
March 23 to 27.

New Jersey Gas Association,
Trenton, N. J.
March 27.

A. G. A. Distribution Conference,
St. Nicholas Plaza Hotel,
Cincinnati, Ohio.
April 8, 9, and 10.

Maryland Utilities Association,
Baltimore, Md.
April 10.

Missouri Association of Public Utilities,
Excelsior Springs, Mo.
April 16, 17, and 18.

A. G. A. Accounting Conference,
Stevens Hotel,
Chicago, Ill.
April 23 and 24.

Pennsylvania Gas Association,
Galen Hall,
Wernersville, Pa.
April 28 to 30.

Chamber of Commerce of United States,
Atlantic City, N. J.
April 28 to May 1.

A. G. A. Executive Conference,
Ambassador Hotel,
Atlantic City, N. J.
May 1 and 2.

A. G. A. Natural Gas Department,
Peabody Hotel,
Memphis, Tenn.
May 11 to 14.

Institution of Gas Engineers,
London, England.
June 2, 3, and 4.

Canadian Gas Association,
Montreal, Quebec.
June 4 and 5.

National Electric Light Association,
Atlantic City, N. J.
June 8 to 12.

Southern Gas Association,
Chattanooga, Tenn.
June 9, 10, and 11.

A. G. A. Domestic Appliance Course,
Testing Laboratory,
Cleveland, Ohio.
June 15 to 20.

Pacific Coast Gas Association,
San Francisco, Calif.
September.

American Electric Railway Association,
Atlantic City, N. J.
September 26 to October 2.

American Gas Association,
Atlantic City, N. J.
October 12 to 16.

Peoples Gas Light and Coke Company, Chicago, will deliver an address setting forth the attitude of the gas industry as it relates to agriculture.

The Gas Association will meet on the morning of the first day with the State Electric and State Electric Railway Associations in joint session. C. E. Paige, president of the American Gas Association and vice-president of The Brooklyn Union Gas Company will address the meeting.

The afternoon session on the first day will be devoted entirely to gas. A paper will be presented on "Natural Gas" and another will deal with the subject "Load Factor or Filling the Summer Valley in the Load Curve." A prominent speaker will be heard at this session on "Utility Merchandising."

The second day will be devoted to a conference with agricultural interests for a general discussion of the subject "Extending Utility Services to Rural Areas." This plan was tried last year with great success and is considered desirable for a state that rates so high agriculturally as does Illinois. The extension of gas service to outlying communities and the servicing of gas in rural districts from interconnecting mains will be discussed.

Gas for Heat, Light and Power

(Continued from page 58)

ers are now available that can be cemented into the door opening and fire directly into the fire box, thereby supplanting the coal fires the boilers were originally designed for. These burners are complete combustion units and are provided with automatic controls so that the desired steam pressure can be maintained mechanically and without the attention of an operator. Gas is supplied by the Kansas City Gas Company.

A predetermined steam pressure is maintained on the boilers by an automatic spring valve in the gas supply line which is directly connected with the steam header by a small pipe. This four-port valve is normally held open by the tension of three concentric coil springs, but when the steam pressure rises above the point set on the regulator, the diaphragm compresses the springs which forces the valve stem down and closes the valve. This reduces or shuts off the gas supply, as the case may be, until the furnace heat and steam pressure have dropped sufficiently, when the reverse action takes place. A bypass and pilot light is always used in conjunction with this control.

The installation of the gas firing equipment in the boilers in this store was complicated because only one and three-fourths oz. gas pressure was allowed and yet the boilers had to be operated from 150 to 200 per cent of rating.

Car— Bus and Window Cards

Reproductions of

A. G. A. Poster Service

—6 Of Them—

Size 11 x 21 inches

Are available for your Gas Advertising and Sales Campaign at a cost of about twenty cents each.

Order now or write for further information.

Publicity and Advertising Section

AMERICAN GAS ASSOCIATION

420 Lexington Avenue, New York, N. Y.

Research Progress in Eliminating Industrial Gas Burner Noises

(Continued from page 60)

creased outputs, and likewise in better employer-employee relations. The Industrial Research Committee believes the classification of gas as a noiseless fuel added to its many other advantages will still further assist in placing it in a stronger position in the field of competitive fuels.

Chimney Construction and its Relation to Condensation from Gas House Heating Equipment

(Continued from page 67)

boiler is followed by some companies, the theory being, as is evident, that condensation will run into the chimney and drain away. In general, a length of 20 foot horizontal run is the limiting figure for gas boilers or furnaces.

The vent pipe should not have many turns, and to reduce the friction as much as possible, all turns should be of wide radius. Flue pipe after its installation should be strapped and wired so that a jar or accidental blow will not knock it down. The usual practice is to use straps frequently enough that there are no unsupported lengths over 8 feet.

Do You Understand the Backdraft Diverter?

Although the backdraft diverter has been mentioned several times, and has been illustrated in Fig. 1, a brief summary of the reasons for its use with all gas burning equipment may be advisable.

To raise the standard of gas appliances of all kinds, the gas industry, in cooperation with the United States Public Health Service, Bureau of Standards, Bureau of Mines, Master Plumbers Association, and Heating and Piping Contractors National Association formulated testing codes under which gas boilers and furnaces must be tested for approval. One of the provisions of these codes is that backdraft diverters shall be used on all boilers and furnaces. The boiler must be designed to operate satisfactory without any draft other than that caused by the appliance itself. Therefore, when a boiler or furnace is connected to a chimney, the chimney must only serve to remove the products of combustion which are being discharged from the appliance. There must be no pull on the boiler itself, and therefore a backdraft diverter is required.

When automatic gas burners are applied to existing coal boilers, which are not equipped with backdraft diverters, the question arises whether these appliances should be so equipped. Although the practice varies, it is the opinion of the leaders in the industry that converted, as well as gas-designed equipment should be provided with a backdraft diverter. Space will not permit in this article going into the many other reasons why a diverter is advantageous, but it should be evident to the discerning that the general acceptance of a practice by so many leading engineers is based on good and sufficient reason.

Demonstrates Supremacy of Gas for Cooking

"In our gas kitchen," said Mrs. Z. B. Bolles, manager of Vassar House, "what else indeed pray tell would we use?"

"And I want you to know we are right-up-to-the-minute here—with our Radiant Surface gas broiler, for instance—that gives us the same intense heat you get from the charcoal broilers, only better, more even and steadier and oh! so much cleaner."

"We have a solid sheet of hot coals above our steaks or half broilers."

Vassar House, Inc., is a unique restaurant with modern decorations and modern equipment seating 250 guests, founded and operated solely for the purpose of raising funds for scholarships. It is located on Michigan Avenue, Chicago, and is owned and supervised by the Vassar College Alumnae of Chicago and vicinity. It is now in its fifth successful year and during that time it has never solicited the patronage of the public as a philanthropic venture, but has prospered solely as a restaurant offering a really exceptional cuisine and service at moderate prices.

Radiant Surface Gas Broiler

This Radiant Surface Broiler over which Mrs. Bolles enthuses was developed and perfected through research sponsored by the committee on Industrial Gas Research of the American Gas Association jointly with The Surface Combustion Co. and Standard Gas Equipment Corp. The principle is entirely new. Radiant heat is produced on the face of a porous alundum slab. The gas is forced through the slab and lighted on the exposed face which it quickly brings up to incandescence, thus producing a radiant bed of fire like that produced by charcoal, heretofore considered the finest means for broiling food in restaurants. The advantage is that the heat can be produced almost instantly at a turn of the valve. It demonstrates again the supremacy of gas as a cooking fuel.

"The broiler," said Mrs. Bolles, "preserves the flavor in the meat. The heat flame from the alundum slab seals the surface of the meat as soon as it hits the broiler, and holds in the juices, retaining the flavor—the 'red hot' surface does that."

Are You Wearing the A. G. A. Pin?

These small emblems, designed in blue and gold, are unusually attractive and durable. Price $2.

MAIL THE COUPON

AMERICAN GAS ASSOCIATION,
420 Lexington Avenue,
New York, N. Y.

Here's my check for $2. Please send me an A. G. A. Membership Pin.

Name .....

Address .....

City .....

450 Enroll in Industrial Gas Salesmanship Course

This course is designed to develop Sales Technique in gas company personnel responsible for Industrial, Hotel and Restaurant, and Large Volume gas sales generally.

For further information address

INDUSTRIAL SECTION

AMERICAN GAS ASSOCIATION
420 Lexington Avenue
New York, N. Y.

The Emergency Crew

I've a high regard for the Gas-House Bard,
Who sings his songs of the "Works,"
Of the grand "Old Guard," and the gang in the yard,
For this eulogy never irks;
In the Shops and the Street and the Storeyards neat
Men are steady and staunch and true,
But I swear there are none who are kept on the run
Like the Gas Emergency Crew.

There's a crack in a main (or a rat in a drain),
Then a pay-clerk swallows a pin;
It's a fire alarm, or a fractured arm,
Or the walls of a trench caved in.
Here's a suicide—poor fellow tried
To "go out by the gas route" too—
Don't lose your poise, just call up the boys
On the Gas Emergency Crew.

For the fever, or "flu," pneumonia too,
When the flicker of life is low,
When you're flat on your back with a heart attack,
If the Doc. calls up, they'll go;
And if you survive till the boys arrive
They'll be able to bring you to.
All they need is "a break" when a life's at stake,
The Gas Emergency Crew.

If the word is passed that a man is gassed,
Out flashes the big red car,
Like a crimson streak, while the sirens shriek.
"Fall back! Men!—Here they are!"
There's a lad on the ground but they'll bring him 'round,
With their Oxygen—CO_2;
The best part of their trade is to bring First Aid,
This Gas Emergency Crew.

They have wallowed in mud, and proffered their blood,
And they've fought through an endless night
For the life of a child, till the surgeons smiled
And they knew they had won the fight.
If your back's to the wall they'll respond to your call,
And they'll stick till they see you through,
They're the best in the land, so let's give them a hand,
OUR GAS EMERGENCY CREW.

—GLENN E. GENUNG,
Detroit City Gas Co.

T. R. Weymouth Named Executive Board Member

T. R. WEYMOUTH, vice-president of the Columbia Gas and Electric Company with head quarters in New York, N. Y., was elected a member of the Executive Board of the American Gas Association at the January meeting.

Mr. Weymouth succeeds Raymond Cross, president of the Ohio Fuel Gas Company, Columbus, Ohio, resigned.

JOHN J. ARMSTRONG, 65 years old, secretary of the Consumers Gas Company of Toronto, and representative of the Canadian Gas Association on the Managing Committee; Accounting Section, American Gas Association, died Dec. 28 at his home in Toronto, Canada.

Mr. Armstrong was a well-known citizen of Toronto, being a member of the Board of Trade, a Mason and Rotarian. He took an active interest in aquatic sports, and was a past president of the Argonaut Rowing Club, and a member of the Royal Canadian Yacht Club.

Mr. Armstrong had been with the Consumers Gas Company since 1892, and had served as its secretary from 1912 until his death. In 1927 he was president of the Canadian Gas Association.

Arkansas Business Men Hear Clevenger

KEITH CLEVENGER, director of publicity and advertising, of the American Gas Association addressed the annual meeting of the Associated Industries of Arkansas, held at Little Rock, January 8. His subject was "Industry and the Utilities."

Officers Re-elected

AT the annual meeting of the Commercial Council of the Consolidated Gas Company of New York and affiliated gas companies, on January 8, officers were re-elected as follows:

Chairman, Nils T. Sellman, director of sales and utilization, and assistant secretary; vice-chairman, Frank L. Hallock, assistant to the vice-president, commercial relations; recorder, Howard F. Weeks, assistant manager, advertising and display bureau.

Technical Section

R. G. GRISWOLD, Chairman H. W. HARTMAN, Secretary K. H. CREE, Asst. Secretary I. K. PECK, Vice-Chairman

Distribution Conference to be Held in Cincinnati During April

THE eighth annual conference of the Distribution Committee, Technical Section, American Gas Association, will be held at the St. Nicholas Plaza, Cincinnati, Ohio, April 8, 9 and 10.

The Conference this year is expected to draw considerable attendance from the West and Middle West States, and an interesting program is being arranged with numerous and diversified subjects which should be of interest not only to distribution engineers, but every man connected with the industry.

It is planned to hold six sessions, two on each of the three days.

Arrangements are being made to hold an evening session on the second day, in order that the afternoon may be devoted to sight-seeing trips to points of interest.

The Union Gas and Electric Company, in Cincinnati, has consented to cooperate in making the Conference a success, and is arranging details of the trips to points of interest around the city, and also visits to the numerous departments and plants of the gas company.

The night session, permitting a free afternoon for sight-seeing, is a new feature of the Conference.

Papers and reports scheduled for the programs at the Conference are expected to reveal much interesting information. The subjects will be of importance to those interested in the distribution of natural gas, and all the problems encountered with regard to leakage, oil fogging, corrosion, etc. The Pipe Joints Committee will have an interesting report to deliver along with the Cast Iron Pipe Standards Committee, and the committee which is handling pipe coatings and corrosion.

The Meters Committee is planning on presenting data with regard to meter diaphragm deterioration, and the testing of large capacity gas meters. The subject of distribution design, as related to high-pressure transmission for outlying areas, is being considered and some figures will be ready for presentation at the Conference.

A definite program for the Distribution Conference will be available at an early date and it is expected that the Conference this year will attract an unusually large attendance.

Gas Refrigeration Sales Booming

A 60 per cent increase in sales of automatic gas refrigerators was accomplished during 1930 by the Consolidated Gas Company of New York and affiliated gas companies, according to a statement issued last month.

Orders for 32,423 gas refrigerators, or the equivalent of 540 car loads, were received by the company, as compared with orders for 20,273 refrigerators in 1929, and 5,345 in 1928. September, 1930, was a record month for refrigerator sales in the company's history, when orders for 4,601 refrigerators were received.

It is estimated that the refrigerators sold during 1930 will use more than one-half billion cubic feet of gas annually, according to O. H. Fogg, vice-president in charge of commercial relations.

"The large increase in gas refrigerator sales, achieved in the face of general depression and lessened building activity, indicates the extent of public demand for automatic refrigeration, which has been accepted as a necessity by the landlord as well as the tenant," Mr. Fogg said.

"The sale of gas refrigerators was in many cases accompanied by the sale of modern gas ranges, indicating a trend to complete modernization of the kitchen with automatic appliances."

A Glimpse of Cincinnati's Skyline. The highest building in the center is the St. Nicholas Plaza, where the 1931 Distribution Conference will be held.

Commercial Section

E. R. ACKER, Chairman — J. W. WEST, Jr., Secretary — SAMUEL INSULL, Jr., Vice-Chairman

Mid-West Regional Sales Conference Opens February 12

DEVELOPMENTS in the industry, which have occurred during the past year, will be discussed at the 1931 Mid-West Regional Gas Sales Conference, sponsored by the Commercial Section of the American Gas Association, which will open a two-day session at the Hotel Sherman, Chicago, Ill., February 12. Prominent speakers will discuss sales methods and promotional plans for the coming year, and an unusually large attendance is anticipated.

Because 1931 will be a transition period from manufactured to mixed or natural gas distribution for many of the mid-west companies, the discussion of sales and allied activities during the period of change-over will form an important part of the Conference program.

In view of this fact, special invitations to attend have been extended to sales managers, branch managers and supervisors.

The final program, it is expected, will be announced at an early date.

Members of the Mid-West Regional Gas Sales Council are as follows:

C. A. NASH, *Chairman*, The United Light and Power Co., Davenport, Ia.

F. M. ROSENKRANS, *Vice-Chairman*, Gas Service Co., Kansas City, Mo.

C. A. GOULD, *Regional Secretary*, The Peoples Gas Light & Coke Co., Chicago, Ill.

E. J. BOYER, Minneapolis Gas Light Co., Minneapolis, Minn.

M. B. BUCKLEY, Kansas City Gas Co., Kansas City, Mo.

E. L. CALLAHAN, Central Public Service Corp., Chicago, Ill.

A. F. DAVEY, Wisconsin Public Service Corp., Sheboygan, Wis.

W. R. EVANS, The Peoples Gas Light & Coke Co., Chicago, Ill.

D. H. FRAZIER, JR., Battle Creek Gas Co., Battle Creek, Mich.

F. S. FUGATE, Detroit City Gas Co., Detroit, Mich.

E. L. HINCHLIFF, Middle West Utilities Co., Chicago, Ill.

C. H. KALLSTEDT, Western United Gas & Electric Co., Aurora, Ill.

G. C. KLOPF, Wm. A. Baer Co., Chicago, Ill.

R. O. JASPERSON, Milwaukee Gas Light Co., Milwaukee, Wis.

STANLEY JENKS, Northern Indiana Public Service Co., Hammond, Ind.

W. L. JONES, The St. Louis County Gas Co., Webster Groves, Mo.

E. LONGGOOD, Northern Indiana Public Service Co., Hammond, Ind.

C. A. LUTHER, The Peoples Gas Light and Coke Co., Chicago, Ill.

F. X. METTENET, Indianapolis, Ind.

W. F. MILLER, Public Service Co. of Northern Illinois, Chicago, Ill.

IRA STEELE, Des Moines Gas Co., Des Moines, Ia.

LOUIS STEIN, Northern States Power Co., Minneapolis, Minn.

J. K. SWANSON, Minneapolis Gas Light Co., Minneapolis, Minn.

STANLEY TABER, Iowa-Nebraska Light and Power Co., Lincoln, Neb.

ORDER YOUR A. G. A. Outdoor Posters NOW

If you are planning to push the use of gas in 1931 from every point of visual vantage—if you want to get posters at much less cost than otherwise—if you want to contract for outdoor space before the rush of business makes suitable location hard to get, order the A. G. A. Outdoor Poster Service now.

The first of this set of six lithographed posters will be available December 27. They are of standard 24-sheet size—12 x 25 feet, with space for company imprint. Posters with your imprint will be furnished at a cost not exceeding $3 each.

PUBLICITY AND ADVERTISING SECTION

AMERICAN GAS ASSOCIATION
420 Lexington Avenue
New York, N. Y.

Publicity and Advertising Section

JAMES M. BENNETT, Chairman ALLYN B. TUNIS, Secretary DONALD M. MACKIE, Vice-Chairman

Minneapolis Advertisement Stirs Favorable Comment

AT the turn of the year, the Minneapolis Gas Light Company, Minneapolis, Minn., published in the newspapers of that city an advertisement which has attracted an unusual amount of favorable comment.

Under the caption "Why wait for a magic hand to turn the green light?" this company, over the signature of its president, John K. Swanson, says:

"The City of Minneapolis is not waiting for some magic hand to turn the semaphore and flash a 'Go' signal to business.

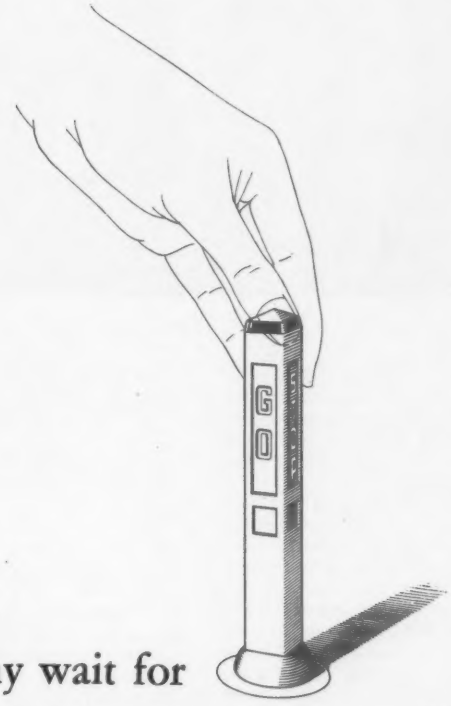
"On the eve of the year, Minneapolis is one of the favored communities in the United States . . . yes, in the world.

"Your gas company will express its confidence in the future of Minneapolis by continuing its steady program of investment and improvement, to meet future requirements, without curtailment. This money will go for new buildings, new pipe line extensions, new manufacturing improvements.

"Our engineers know from experience that Minneapolis, in 1931, will gain 9,000 or 10,000 new citizens . . . many new industries. We are ready for 1931, with a modern economical step rate for gas, with an improved domestic and industrial service, and with lower prices on appliances and equipment.

"Make no mistake about this fact . . . the city of Minneapolis is moving ahead without waiting for any magic 'Go' signal."

For the benefit of its readers, the A. G. A. MONTHLY takes pleasure in reproducing the advertisement, greatly reduced, on this page.



Why wait for a *magic hand* to turn the green light?

The City of Minneapolis is not waiting for some magic hand to turn the semaphore and flash a "Go" signal to business.

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Make no mistake about this fact . . . . the city of Minneapolis is moving ahead without waiting for any magic "Go" signal.

MINNEAPOLIS GAS LIGHT COMPANY

JOHN K. SWANSON, Vice-Pres. and Gen. Mgr.

GAS IS THE MODERN FUEL

Home Service Activities

School of Cookery

Interested Group at Work in the Providence Gas Company's School of Cookery

By KATHLEEN ATKINSON
Home Service Director, Providence Gas Company

OUR Cooking School, as it is called by those who eagerly attend it, is three years old and, as far as we can judge, there is sufficient interest in it to keep it going almost indefinitely, for it is meeting a real need in our community.

It was started because, in talking with the groups who were coming to our lecture demonstrations, we found a great many women were having difficulty with pastries; so many, in fact, that it seemed as if we were missing an opportunity for service that would benefit both our customer and us, for if she were taught how to make delicate pie crust easily, would she not make it more often? And if she learned the advantages of heat control and insulation through using our ranges, would she not buy that type of range when next in the market for such a purchase? And having received the personal instruction she needed, was it not likely she would enthuse over all the gas company had done for her, telling her friends about the service?

So a small class was formed and quickly filled, and the first thing we knew we had a waiting list that grew so long we decided to continue the classes through the season, giving four two-hour lessons to each group. Our equipment had to be augmented, and since our big kitchen could be made to accommodate a class of ten, this determined the size of the first groups. For two years 20 women met each week to bake pastries, make holiday candies, or learn the rudiments of plain cooking. Great was the enthusiasm produced. Homemakers of considerable experience, business girls, and brides, all ages and types, have been members of these classes, and without an atom of exaggeration I can truthfully say that we have made these 360 women as friends of the gas company forever.

We have increased our facilities this year and now have a regular attendance of between 80 and 90 women and girls every week. Cake baking is engrossing the women, and many beautiful cakes are being triumphantly carried home. We have had a number of engaged girls in the groups this fall, none of whom knew anything about cooking, and I wish you could have seen their eyes shine when their first attempts were successful. "Of course," said one, "some of it is due to this heat control." Needless to say, this girl when she marries will buy a range similar in type to the one she has been using. Saturday mornings high school girls swarm all over the place, laughing and chattering together as they learn how to make simple dishes. Both groups are taught all about the use and care of the modern gas range and the gas refrigerator.

How do we manage these lessons? We have ranges and refrigerators set against the walls of our big kitchen and across the back of our lecture hall. In front of each range we have a table with equipment in the drawer and in the compartment under the gas burners of the range. Two women use one range and table, each making half of the same recipe. Eight recipes are made in the group, so that every one has an opportunity to see all the cakes finished. There is easy access to the refrigerators and the sink, and to a general food supply table from which all materials needed are taken. The women seem to find working conditions easy for they act quite as if they were at home. General instruction is given at the beginning of the class by the girl who has charge and then she and her assistant give personal help as the women work.

We are planning a class in general cookery, refrigerator dishes, and table service for domestics. Questionnaires, sent to a selected list of prospects for new gas equipment, are beginning to come back checked with the subjects they would like to have taught to their cooks. Another course is being planned around kitchenette cookery for business girls and brides; and

A Class at the Providence Gas Company's School of Cookery

if we find a demand for another cake class that, too, will be formed.

And so you see we are trying to meet the demand for this type of service, and through it perhaps interest a larger group in gas equipment. We know the women who have gas ranges are using the recipes they get for they frequently laughingly tell us that since they have been coming to our Department their gas bill has considerably increased. They don't seem to mind this, for they say they are enjoying trying the rules.

"I wouldn't miss a lesson for anything," many of them say. And, "I haven't had so much fun for a long time," the rest of them tell us. "How does the gas company do so much for us!" they all exclaim.

Gasettes

Sioux City, Iowa, also has such a school of cookery as mentioned in the article by Miss Atkinson, of Providence. This school is under the direction of Mrs. Elma Bails, home service director of the Sioux City Gas & Electric Company.

Mrs. Bails has been conducting these classes for about two years and they seem to "fill the bill" in Sioux City better than the demonstration type of school because there are many other highly advertised demonstrations in the city.

Each class of eight pupils meets once each week for four weeks. Each woman is allowed to bake whatever kind of a cake or pie she desires; she pays only for the materials she uses, and she takes the finished product home in a box provided for that purpose.

The equipment consists of three domestic science unit tables and two cabinets from the KeWaunee Manufacturing Company, KeWaunee, Wisconsin, four gas ranges, a huge refrigerator, an electric sink and dish washer, an automatic gas water heater, and many small appliances.

The young housewives are especially invited but older women are often as interested as the younger ones. It is ascertained just what each group is especially interested in—table service, diet, etc. —and a short talk on the subject is given some time during the lesson. It is all informal; the class gets acquainted and asks to come back for more lessons.

That "Inexorable" Gas Bill

(Continued from page 53)

monthly bill. If the customer could be induced to set aside a nickle a meal, or ten cents a day, to pay the monthly gas bill, there would probably be a credit balance at the end of the month, and paying the gas bill would pay the payer a profit, and be a cause for rejoicing and mirth, rather than curses and tears.

It should be no hardship. They have to pay carfare daily, and get no return at the end of the month. By schooling themselves to pay their gas bill daily, but putting a dime or fifteen cents or whatever may be necessary, into a small savings bank they would not only have on hand enough money to pay the bill, but carfare, "movie money" or some other little treat. Assuming the gas bill is less than $3 as it generally is.

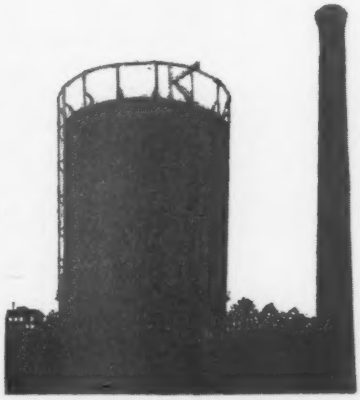
The monthly gas bill may be made a subject of rejoicing, or not too well-off fellow citizens may be calling down blessings on the company, which candor overcoming native modesty compels us to admit we are justly entitled to, if, and when, we educate our clientele to voluntarily paying their gas bills daily.

Use of Color in Appliances Shown

ADVANCES made in the use of color in gas equipment are being shown at the Exhibition on the Science and Art of Color which is being given by the Museum of Science and Industry of New York at its headquarters in the Daily News Building, 220 East 42nd Street, New York, N. Y. The exhibition will continue until March 15.

Mr. Paige Honored By French Organization

Clifford E. Paige, president of the American Gas Association, has been elected an honorary member of the *Union Syndicale de l'Industrie du Gaz en France,* according to information received last month from Paris.



Are You Using A. G. A. Household Information Service ?

Nearly 200 Gas Companies find this feature an ideal way to tell the housewife about the benefits of gas and gas appliances.

For Full Information Write the

Publicity and Advertising Section

AMERICAN GAS ASSOCIATION
420 Lexington Avenue
New York, N. Y.

Natural Gas Department

H. C. COOPER, Chairman — E. J. STEPHANY, Secretary — H. L. MONTGOMERY, Vice-Chairman

Natural Gas Convention Opens May 11

FIELD operating problems, drilling and production, will be among the outstanding topics to be discussed at the convention of the Natural Gas Department of the American Gas Association which will take place in Memphis, Tenn., May 11 to 14, according to announcement made by H. C. Cooper, of Pittsburgh, Pa., chairman of that group.

Program details now are in the process of being whipped into final shape. Announcement of the names of speakers and their subjects will be made at an early date. Developments in the conservation study inaugurated at the last annual meeting of the Natural Gas Department are on the program of papers and discussions which will be submitted at this time and this is expected to add an interesting chapter to the proceedings.

The Hotel Peabody has been selected by the committees in charge of the convention. These committees are composed of the following members:

General Arrangements—W. J. O'Brien, Chairman, Memphis Power and Light Company, Memphis, Tenn.; B. C. Adams, Gas Service Company, Kansas City, Mo.; J. B. Corrin, Standard Oil Company of New Jersey, Pittsburgh, Pa.; H. L. Dickerson, United Gas Corporation, Houston, Texas; Edgar G. Hill, Arkansas Valley Natural Gas Co., Colorado Springs, Colo.; Alfred Hurlburt, Central Public Service Corp., Chicago, Ill.; J. R. Munce, Arkansas Natural Gas Corporation, Shreveport, La.; F. F. Schauer, Equitable Gas Company, Pittsburgh, Pa.; D. C. Shaffer, Memphis Natural Gas Company, Memphis, Tenn.; T. R. Weymouth, Columbia Gas and Electric Corporation, New York City; William Moeller, Jr., Southern California Gas Company, Los Angeles, Calif.

Program Committee—E. F. Schmidt, Chairman, Lone Star Gas Company, Dallas, Texas; W. A. Dunkley, Memphis Power and Light Company, Memphis, Tenn.; L. Fitzpatrick, Western Public Service Company, Salt Lake City, Utah; T. H. Kerr, Columbia Gas and Electric Corp., Columbus, Ohio; J. H. Maxon, North American Light and Power Co., Omaha, Nebr.; A. E. Merchant, New Orleans Public Service, Inc., New Orleans, La.; H. L. Montgomery, Cities Service Gas Company, Bartlesville, Okla.; W. B. Trammell, Houston Natural Gas Company, Houston, Texas; George Wehrle, Public Service Company of Colorado, Denver, Colo.; W. S. Yard, Pacific Gas and Electric Company, San Francisco, Calif.

Publicity Committee—Paul Renshaw, Chairman, Memphis Power and Light Company, Memphis, Tenn.; J. C. Barnes, New Orleans Public Service, Inc., New Orleans, La.; W. C. Grant, Lone Star Gas Company, Dallas, Texas; C. D. Greason, Gas Service Company, Kansas City, Mo.; R. S. McBeth, Oklahoma Natural Gas Corporation, Tulsa, Okla.

Hotels Committee—J. J. Brennan, Chairman, Memphis Power and Light Company, Memphis, Tenn.

Reception Committee—W. N. Ford, Chairman, Memphis Power and Light Company, Memphis, Tenn.

Home Study Course in Natural Gas

THROUGH the combined efforts of the Natural Gas Department and the Committee on Education of Gas Company Employees, arrangements have been made with the University of Kansas for a home study course on natural gas. The course, which will fill a real need in the industry, is being prepared under the direction of Professor C. M. Young of the University.

An Advisory Committee, consisting of the following prominent natural gas engineers, has been appointed to supervise and approve the material for this course:

J. D. Creveling, Henry L. Doherty & Co., New York, N. Y.; F. L. Chase, Lone Star Gas Co., Dallas, Texas; A. B. Macbeth, Southern California Gas Co., Los Angeles, Calif., and J. B. Garner, Hope Natural Gas Co., Pittsburgh, Pa.

Natural Gas Department

1930 PROCEEDINGS

Just Published

Contains complete discussions and reports presented at the annual convention in New Orleans. Greatly increased activity and interest in the development of natural gas has created a real demand for all material and it is imperative that you order early before the limited supply is exhausted. A few copies of the 1929 edition are still available. Get them while they last at $2.50 a copy for either edition.

AMERICAN GAS ASSOCIATION

420 Lexington Avenue

New York, N. Y.

Accounting Section

J. I. BLANCHFIELD, Chairman H. W. HARTMAN, Secretary WILLIAM A. DOERING, Vice-Chairman

Accounting Section Conference to Open April 23 at Chicago

THE Managing Committee of the Accounting Section, at its meeting November 18, approved an organization to prepare a program for the Accounting Section Conference which would divide the activities into the following groups:

General Accounting.
Customer Accounting.
Customer Relations.
Office Management.

Following the meeting of the Managing Committee, these groups have held meetings and conferences, and a program is rapidly taking shape which will offer something of interest to all members who have been active in the section. While this program has not been finally approved, it may be said that several innovations are being considered, designed to bring out a frank discussion of the accounting and commercial office problems at present confronting companies. One of the new features suggested is to hold group luncheon meetings, supplementing the regular sessions, and at which the answers to specific problems will be discussed and later presented to the groups at the regular sessions.

A committee has been formed to obtain from the members of the section a series of questions or problems which may be confronting them in their work, and a symposium on the replies secured to these questions will be held at the conference under the general caption of "What Would You Do?"

Problems involved in the therm basis of billing for gas is another subject proposed for a paper at the conference.

An analysis of developments in rate changes will be presented by the Statistical Department.

The Customer Relations Group is securing papers and speakers on subjects such as the General Service Department and Special Contact Men for the Inspection of Customers' Complaints; Routines and Practices followed in Initial and other Customer Contacts; and it is hoped to secure a symposium on the progress being made in the A. G. A. Course on Employee-Customer Relations.

E. B. Nutt, of the Hope Natural Gas Company, chairman of the Committee on Natural Gas Representation, has promised some interesting features from the standpoint of the natural gas accounting and natural gas developments.

The Committee on Mechanical Office Equipment is cooperating with the Customer Accounting Division and it is hoped that a paper will be secured on Machine Developments in Customer Accounting work.

The Joint Committee on Merchandise Accounting will make a presentation on the progress accomplished in cooperation with the Commercial Section.

The Insurance Committee is preparing a presentation of the helpful work it has done during past years on various forms of insurance for gas companies.

The Office Management Group has under consideration papers on the subject of standard practice manuals, and on vestibule schools or pre-assignment training.

The conference will be held at the Stevens Hotel, Chicago, Illinois, April 23 and 24, and it is hoped to have a good attendance of mid-western accountants and natural gas representatives.

The program, it is expected, will be published in the March issue of the A. G. A. MONTHLY.

WHAT THE GROUP LEADERS SAY

Some Unsolicited Comments on the A. G. A. Course in Employee-Customer Relations

All members seemed to feel that the hour had passed too quickly. Discussion was general throughout the whole group.

* * * *

Those who have never evinced a desire to learn anything about the gas business other than that which was absolutely necessary, have started to take an interest in the problems of our company.

* * * *

Many more questions were about to be asked when we found the hour had passed and I was obliged to close an interesting conference.

* * * *

I made a survey of the members to find out what they knew about our rates. Half of them had no accurate knowledge of the subject.

* * * *

Complete information from K. R. Boyes, American Gas Association, 420 Lexington Ave., New York, N. Y.

* * * *

Enrollment to Date 4,400 *—And Growing!*

Gas Appliance and Equipment Developments

Noiseless Roller Bearing Valve Wire Guide

The Lambert Meter Company announces an improvement in the construction of its large size meters known as a "noiseless-roller-bearing-valve wire guide."

Ruud Ad Plans Ready

The Ruud Manufacturing Company, of Pittsburgh, Pa., has issued the first section of its sales and advertising plans for 1931. The title is "The Hot Water Log" and may be had by writing the manufacturer.

Dearborn Issues Book

"Scientific Water Connection" is the title of a book recently published by the Dearborn Chemical Company.

Majestic Incinerator

The Majestic Incinerator is the latest addition to the line of products manufactured by The Majestic Company, Huntington, Ind.

New Orifice Prover Outfits

For the purpose of accurately proving displacement meters in place by a company's own maintenance men instead of shipping them to the makers or to a meter shop, American Meter Company, through Metric Metal Works at Erie, Pa., has brought out assemblies of testing equipment known as the Pierce Critical Flow Orifice Prover, and the Metric Low-Pressure Flow Prover.

Koppers Issues Pamphlet

The Koppers Construction Company, Pittsburgh, Pa., recently has issued a pamphlet on Becker Oven By-Product Coke and Gas Plants.

Staynew in New Home

The Staynew Filter Corporation, of Rochester, N. Y., manufacturers of Protectomotor Air Filters, has moved its factory and home office to new and larger quarters at 25 Leighton Ave., Rochester.

Tappan Adds to Line

The Tappan Stove Company, Mansfield, Ohio, is introducing a complete line of console—low compact models.

Determines B.t.u.

The Connelly Iron Sponge & Governor Company, Elizabeth, N. J., is introducing the Caloroptic, which is a direct reading calorimeter for the quick determination of the heat value of illuminating gas in British thermal units, without the employment of calculations for corrections, for barometer, thermometer, pressure, and etc.

Contributions by manufacturers of gas appliances and equipment to this department will be welcomed by The A. G. A. Monthly. On account of space limitations, all announcements of new products, improvements, etc., should be limited to about 100 words. No attempt will be made to describe each product or give details of construction. For such details address the manufacturer direct. Where justified, photographs will be used to illustrate these brief items. All contributions to this department should be addressed to C. W. Berghorn, Secretary, Manufacturer's Section, American Gas Association, 420 Lexington Ave., New York, N. Y.

To Compete Unit Electric Ovens

The G. S. Blodgett Co. Inc., of Burlington, Vt., announces a new sectional automatic controlled gas oven, which has been manufactured for the purpose of competing with the sectional electric ovens.

Arco Publishes Book

"Heat and the Span of Life" is the title of a booklet just published by the American Radiator Company, New York, N. Y.

Mono-Cast Shop for Large Sizes

A new Mono-Cast centrifugal pipe shop for making large sizes of pipe up to and including 24-inch is being completed by the American Cast Iron Pipe Co., Birmingham, Ala. The new shop will have a potential capacity of 200 tons of centrifugally cast iron per shift.

New Hot Stream Lines

The Hot Stream Heater Company, Cleveland, Ohio, has just placed on the market two new lines, Indirect Water Heaters and Drat-O-Stats, (draft controls).

Catalog on Pumps

The M. T. Davidson Company, 154 Nassau Street, New York has issued a catalog covering steam and centrifugal pumps which they will send on request.

Company Changes Hands

The Moody Seagraves Company, of Galveston, Texas, and New York, natural gas and oil producers, has through its subsidiary, Eastern States Gas Company, taken over the plant and business of the Gas Engineering Company, of Trenton, New Jersey, owned for many years by the late Frank D. Moses and since his death by Thomas Watson.

To Exhibit at Metal and Machinery Exposition

The Linde Air Products Company, 30 East 42nd Street, New York, N. Y., will occupy Booth C-9 at the National Western Metal and Machinery Exposition, San Francisco, California, February 16 to 20. The feature of the exhibit will be the testing of welded steel coupons with the Oxweld Portable Tensile Testing Machine. Specimens of 50,000-lb. tensile strength steel plate, welded with Oxweld No. 1 High Test and Oxweld No. 21 High Strength Bronze Welding Rods, will be tested.

Association Establishes Gas Appliance Inspection Station on Pacific Coast

(Continued from page 51)

The testing station, as well as inspection work and other matters affecting the Laboratory's activities on the West Coast, will be under the immediate supervision of W. M. Couzens, a graduate of Tri-State University in chemical engineering and a member of the Laboratory staff in Cleveland for nearly five years, a portion of which time he was chief inspector. Mr. Couzens has had charge of all inspection work in California, Oregon and Washington for the past two years, having spent six months in that territory in 1928-1929 and about the same period of time there in 1929-1930. Being well acquainted with the conditions on the Pacific Coast, as well as the details of the Laboratory activities in Cleveland, he is particularly well qualified to supervise this branch of the Laboratory's work.

Through this extension of the Laboratory's activities, the American Gas Association can be of much greater service to the gas industry in the Pacific Coast states.

Monthly Summary of Gas Company Statistics

FOR MONTH OF NOVEMBER, 1930

Issued January, 1931, by the Statistical Department of the American Gas Association
420 Lexington Avenue, New York, N. Y.

PAUL RYAN, Statistician

COMPARATIVE STATISTICS OF 145 MANUFACTURED GAS COMPANIES FOR THE MONTH OF NOVEMBER, 1930

	Month of November			*Eleven Months Ending November 30*		
	1930	*1929*	*Per cent Increase*	*1930*	*1929*	*Per cent Increase*
Customers	8,888,490	8,861,394	0.3	*See November*		
Gas Sales (MCF)	29,585,612	30,082,572	— 1.7	322,660,021	322,399,094	0.1
Revenue (Dollars)	31,554,091	31,860,347	— 1.0	344,298,175	343,423,046	0.3
Gas Produced and Purchased (MCF)						
Gas Produced						
(a) Water Gas	15,448,783	15,932,734	— 3.0	162,664,139	170,677,885	— 4.7
(b) Retort Coal Gas	2,593,172	2,656,994	— 2.4	27,994,946	28,912,006	— 3.2
(c) Oil Gas	705,785	714,699	— 1.2	6,975,646	7,030,854	— 0.8
(d) Coke Oven Gas	4,180,124	3,855,520	8.4	44,445,520	42,002,714	5.8
(e) Reformed Oil Still Gas	269,158	147,441	—	1,895,953	431,113	—
(f) Total Gas Produced	23,197,022	23,307,388	— 0.5	243,976,204	249,054,572	— 2.0
Gas Purchased						
(a) Coke Oven Gas	9,340,642	9,593,924	— 2.6	101,559,152	97,420,369	4.2
(b) Oil Still and Natural Gas	309,540	226,480	36.7	2,298,324	2,304,796	— 0.3
(c) Total Gas Purchased	9,650,182	9,820,404	— 1.7	103,857,476	99,725,165	4.1
Total Gas Produced and Purchased	32,847,204	33,127,792	— 0.8	347,833,680	348,779,737	— 0.3

COMPARATIVE STATISTICS OF 135 NATURAL GAS COMPANIES FOR MONTH OF NOVEMBER, 1930

Customers						
Domestic (Including House Heating)	3,790,162	3,762,891	0.7			
Commercial	173,436	169,453	2.3			
Industrial	12,116	12,286	— 1.4			
Main Line Industrial	1,649	1,403	17.5	*See November*		
Miscellaneous	2,221	2,426	—			
Total	3,979,584	3,948,459	0.8			
Gas Sales (MCF)						
Domestic (Including House Heating)	21,347,134	22,265,291	— 4.1	212,953,097	217,176,574	— 1.9
Commercial	2,748,361	2,882,431	— 4.7	26,482,032	26,806,681	— 1.2
Industrial	13,308,392	17,149,954	—22.4	155,673,448	172,028,493	— 9.5
Main Line Industrial	4,183,269	4,235,297	— 1.2	51,678,956	44,839,771	15.3
Miscellaneous	75,155	97,958	—	1,352,332	1,770,000	—
Total	41,662,311	46,630,931	—10.7	448,139,865	462,621,519	— 3.1
Revenue (Dollars)						
Domestic (Including House Heating)	14,519,700	15,006,948	— 3.2	147,866,651	149,778,191	— 1.3
Commercial	1,440,359	1,574,879	— 8.5	14,770,002	15,159,174	— 2.6
Industrial	3,349,101	4,251,689	—21.2	40,419,614	46,206,963	—12.5
Main Line Industrial	639,272	597,796	6.9	7,494,144	6,276,331	19.4
Miscellaneous	31,133	41,855	—	621,232	762,007	—
Total	19,979,565	21,473,167	— 6.9	211,171,643	218,182,666	— 3.2
Gas Produced and Purchased (MCF)						
Natural Gas Produced	17,035,099	20,409,219	—16.2	194,551,585	196,582,936	— 1.0
Natural Gas Purchased	58,048,794	59,252,391	— 2.0	567,162,881	541,182,602	4.8
Natural Gas Produced and Purchased	75,083,893	79,661,610	— 5.7	761,714,466	737,765,538	3.2
Manufactured Gas Produced and Purchased	1,668,984	3,463,378	—51.8	20,666,793	39,127,255	—47.2
Total Gas Produced and Purchased	76,752,877	83,124,988	— 7.7	782,381,259	776,892,793	0.7
Company Use and Sales to other Gas Companies	29,995,452	31,620,064	— 5.1	298,578,114	280,310,883	6.5
Net Available for Public Distribution	46,757,425	51,504,924	— 9.2	483,803,145	496,581,910	— 2.6

Gas Utility Revenues off in November

REVENUES of manufactured and natural gas utilities aggregated $51,533,656 in November, a decline of 3.4 per cent from the same month of the preceding year, according to reports to the Statistical Department of the American Gas Association from companies representing nearly 90 per cent of the utility distribution of manufactured and natural gas.

The manufactured gas companies reported revenues of $31,554,091 for November, a drop of 1 per cent from a year ago, while revenues of the natural gas concerns totalled $19,979,565, or approximately 7 per cent less than for November, 1929.

Sales of manufactured gas reported for November totalled 29,585,612,000 cu.ft., a decline of 1.7 per cent, while natural gas sales for the month were 41,622,311,000 cu.ft. a drop of nearly 11 per cent. The more marked curtailment in natural gas sales was the result of the relatively larger proportion of industrial business handled by these companies, as natural gas sales for industrial purposes declined from 17,149,954,000 cu.ft., in November, 1929, to 13,308,392,000 cu.ft., in November, 1930, a drop of more than 22 per cent.

This same tendency toward sharp curtailment of industrial sales was also manifest, although to somewhat less extent, in territories served with manufactured gas. In the East North Central States, comprising Illinois, Indiana, Michigan, Ohio and Wisconsin, manufactured gas sales for industrial purposes declined by nearly 16 per cent, the loss being most pronounced in such states as Indiana and Wisconsin, which showed a drop of some 20 per cent in this class of business. In New England the decline in industrial sales was much less severe, and two states, Massachusetts and Connecticut, registered slight increases in gas sold for industrial purposes.

GROUP C—EAST NORTH CENTRAL STATES

(Illinois, Indiana, Michigan, Ohio and Wisconsin.)

(Data reported by 35 companies whose sales constitute 90% of the total sales of manufactured gas in the East North Central States.)

Customers						
Domestic	2,405,183	2,417,905	— 0.5			
House Heating	15,620	13,838	12.9			
Industrial and Commercial	115,977	114,525	1.3			
Miscellaneous	587	440	—	*See November*		
Total (34 companies which segregate)	2,537,367	2,546,708	— 0.4			
Grand Total (35 companies)	2,559,256	2,568,287	— 0.4			
Gas Sales (MCF)						
Domestic	6,353,400	6,645,829	— 4.4	71,545,046	72,175,549	— 0.9
House Heating	579,047	533,928	8.4	4,608,260	4,012,319	14.9
Industrial and Commercial	2,394,005	2,844,405	—15.8	29,226,973	32,547,163	—10.2
Miscellaneous	16,188	15,017	—	147,167	156,127	—
Total (34 companies which segregate)	9,342,640	10,039,179	— 6.9	105,527,446	108,891,158	— 3.1
Grand Total (35 companies)	9,419,532	10,113,382	— 6.9	106,350,514	109,703,639	— 3.1
Revenue (Dollars)						
Domestic	6,805,102	7,043,299	— 3.4	75,989,853	76,361,333	— 0.5
House Heating	451,298	414,537	8.9	3,583,029	3,126,182	14.6
Industrial and Commercial	1,872,236	2,151,476	—13.0	22,160,964	24,048,286	— 7.8
Miscellaneous	12,638	13,065	—	125,359	134,596	—
Total (34 companies which segregate)	9,141,274	9,622,377	— 5.0	101,859,205	103,670,397	— 1.7
Grand Total (35 companies)	9,210,706	9,690,925	— 5.0	102,615,074	104,420,187	— 1.7
Gas Produced and Purchased (MCF)						
Gas Produced						
(a) Water Gas	3,453,463	3,493,696	— 1.2	35,339,813	40,522,931	—12.8
(b) Retort Coal Gas	907,341	1,010,647	—10.2	10,081,625	11,102,879	— 9.2
(c) Coke Oven Gas	1,671,802	1,652,537	1.2	18,287,830	17,791,784	2.8
(d) Other Gas	2,657	1,300	—	20,489	17,350	—
(e) Total Gas Produced	6,035,263	6,158,180	— 2.0	63,729,757	69,434,944	— 8.2
Gas Purchased						
(a) Coke Oven Gas	4,185,897	4,767,242	—12.2	49,870,752	48,370,084	3.1
(b) Natural Gas	78,478	43,255	81.4	598,641	434,923	37.6
(c) Total Gas Purchased	4,264,375	4,810,497	—11.4	50,469,393	48,805,007	3.4
Total Gas Produced and Purchased	10,299,638	10,968,677	— 6.1	114,199,150	118,239,951	— 3.4

Associations Affiliated with A. G. A.

Canadian Gas Association
Pres.—A. T. Leavitt, Hamilton By-Product Coke Ovens, Ltd., Hamilton, Ont.
Sec.-Tr.—G. W. Allen, 21 Astley Avenue, Toronto.

Empire State Gas and Electric Association
Pres.—William J. Welsh, New York & Richmond Gas Co., Staten Island, New York.
Chairman Gas Section—M. F. Clement, Rockland Light & Power Co., Middletown, Ind.
Sec.—C. H. B. Chapin, Grand Central Terminal, New York, N. Y.

Illinois Gas Association
Pres.—H. T. East, Public Service Company of Northern Illinois, Chicago, Ill.
Sec.-Tr.—George Schwaner, 305 Illinois Mine Workers Bldg., Springfield, Ill.

Indiana Gas Association
Pres.—T. L. Kemp, Indiana Consumers Gas & By-Product Co., Terre Haute, Ind.
Sec.-Tr.—P. A. McLeod, Northern Indiana Power Co., Huntington, Ind.

Michigan Gas Association
Pres.—Prof. A. H. White, University of Michigan, Ann Arbor, Mich.
Sec.-Tr.—A. G. Schroeder, Grand Rapids Gas Light Co., Grand Rapids, Mich.

Maryland Utilities Association
Pres.—R. E. Town, Frederick, Md.
Sec.—D. E. Kinnear, 803 Court Square Bldg., Baltimore, Md.

Mid-West Gas Association
Pres.—J. M. Drabelle, Iowa Ry. & Lt. Corp., Cedar Rapids, Iowa.
Sec.-Tr.—Roy B. Searing, Sioux City Gas & Electric Co., Sioux City, Iowa.

Missouri Association of Public Utilities
Pres.—H. M. Patton, Union Electric Light & Power Co., St. Louis, Mo.
Sec.-Tr.—F. D. Beardslee, 315 N. 12th St., St. Louis, Mo.
Asst. Sec.—Jesse Blythe, 103 West High St., Jefferson City, Mo.

New England Gas Association
Pres.—H. Vittinghoff, Stone & Webster, Inc., Boston, Mass.
Exec. Sec.—C. D. Williams, 41 Mount Vernon St., Boston, Mass.
Chairman Operating Div.—A. S. Hall, Springfield Gas Light Co., Springfield, Mass.
Secretary Operating Div.—Paul Buchanan, Hartford Gas Co., Hartford, Conn.
Chairman Sales Div.—J. H. Sumner, Cambridge Gas Light Co., Cambridge, Mass.
Sec.-Tr. Sales Div.—A. M. Slattery, Hoffman Heater Co., Boston, Mass.
Chairman Industrial Div.—L. E. Wagner, Providence Gas Co., Providence, R. I.
Sec.-Tr. Industrial Div.—Charles S. Hilton, Pawtucket Gas Co., Pawtucket, R. I.
Chairman Acctg. Div.—Burton Smart, Portland Gas Light Co., Portland, Me.
Sec.-Tr. Acctg. Div.—Otto Price, Boston Consolidated Gas Co., Boston, Mass.
Chairman Manufacturer Div.—J. D. Taylor, Walker & Pratt Mfg. Co., Boston, Mass.
Sec.-Tr. Manufacturers Div.—J. H. McPherson, 250 Stuart St., Boston, Mass.

New Jersey Gas Association
Pres.—Chester Grey, Atlantic City Gas Company, Atlantic City, N. J.
Sec.-Tr.—H. E. Cliff, Public Service Electric & Gas Co., Newark, N. J.

Ohio Gas and Oil Men's Association
Pres.—L. K. Langdon, Union Gas & Electric Co., Cincinnati, Ohio.
Sec.-Tr.—Wm. H. Thompson, 811 First National Bank Bldg., Columbus, Ohio.

Oklahoma Utilities Association
Pres.—T. H. Steffens, Sand Springs Railway Co., Sand Springs, Okla.
Mgr.—E. F. McKay, 1020 Petroleum Bldg., Oklahoma City, Okla.

Pacific Coast Gas Association
Pres.—R. E. Fisher, Pacific Gas & Electric Co., San Francisco, Calif.
Mang. Dir.—Clifford Johnstone, 447 Sutter St., San Francisco, Calif.

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Pres.—E. G. Boyer, Philadelphia Electric Co., Philadelphia, Pa.
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Pennsylvania Natural Gas Men's Association
Pres.—George E. Welker, United Natural Gas Co., Oil City, Pa.
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Sec.-Tr.—G. H. Schlatter, Birmingham Gas Co., Birmingham, Ala.

Southwestern Public Service Association
Pres.—Knox Lee, Southwestern Gas & Electric Co., Marshall, Texas.
Chairman Gas Section—Frank L. Chase, Lone Star Gas Co., Dallas, Texas.
Sec.—E. N. Willis, c/o University Club, Dallas, Texas.

The Public Utilities Association of Virginia
Pres.—T. Justin Moore, Va. Elec. & Power Co., Richmond, Va.
Sec.—C. O. Roberson, P. O. Box 537, Roanoke, Va.

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Pres.—M. H. Frank, Wisconsin Power & Light Co., Madison, Wis.
Exec. Sec.—J. N. Cadby, 135 West Wells St., Milwaukee, Wis.

Thirteenth Annual Convention of the American Gas Association
Atlantic City, N. J. - - - October 12-16, 1931

Employment Bureau

SERVICES OFFERED

Engineer (33) with fourteen years' experience in gas property appraisals and inventories, rate work, new business and extension projects, statistical and cost work, together with general civil engineering in connection with natural gas property operations. Favorably employed at present, as a department head, but desires a change of location preferably to Ohio or the Middle West. **375.**

Industrial gas **sales engineer,** college graduate, experienced in marketing natural gas, to refineries, glass companies, paint companies, ceramic, power and ice plants, salt companies and heat treating plants. Familiar with design and construction of metering, regulating and burning equipment for industrial application. **376.**

Manager-Superintendent. Twelve years' experience as superintendent of water gas production and general manager; experienced in safety supervision and public relations work; desires position requiring some or all of above experience; age 35; married; technical graduate; prefer southern location; will consider foreign assignment. **377.**

Executive with public utility experience qualified to specialize on rate analysis, electric or gas, desires engagement. **378.**

Manager of gas properties. Twenty years' experience in all phases of the gas industry; comprehensive knowledge of manufacturing, transmission and distribution, with engineering, designing and construction of properties. Good at gaining and holding proper public relations, getting new business and in merchandising. **379.**

Graduate **engineer**—experienced in design, construction and operation of transmission lines, medium- and low-pressure distribution plants, in both manufactured and natural gas; desires position with operating or engineering company. **381.**

Manager and engineer, technically sound, well educated with unusually varied experience of twenty years, thorough understanding of economics of different processes including Reforming of Natural Gas and Oil Gas, By-Product Utilization, Raw Materials and Unit Costs. Accustomed to planning and carrying out improvements, high- and low-pressure distribution layout. **383.**

Gas engineer, M.E. degree. Many years' experience in construction and operation; engineer of production and engineer of distribution of large companies, water gas, coal gas; sale of by-products, appraisals; estimates, budgets, designing, and natural gas conversion. **384.**

Gas engineer (33) M.E., experienced in operation, maintenance, and construction of gas plants, water gas, coal gas, Koppers ovens, and producers. General business experience and accounting. **385.**

Combustion engineer (M.S.) long training and experience with industrial gas applications. Familiar with natural and the various manufactured gases and their practical ratings. Expert advisor on industrial gas sales organizations. Can organize and direct fuel economics for large industrial consumers. Recognized authority on Combustion. Able to promote and direct practical testing and development to extend the use of gas in new fields of application. **386.**

Experienced industrial gas **sales engineer** with excellent sales, technical and educational background, desires position as executive with utility or manufacturer where seasoned personality, initiative, and ability to handle men will be appreciated. **387.**

Manufacturer's representative, New York territory, gas water heaters, space heaters or similar lines wanted. **388.**

Gas engineer, superintendent or assistant general manager (45) holding a technical degree, member A.S.C.E., familiar with all phases of the gas industry, including the public and the rate problem, is open for engagement. Applicant is willing to go anywhere his training and experience can be of use. **389.**

SERVICES OFFERED

Factory representative with manufacturer of gas burning equipment. Ten years' experience in appointing dealers developing territory, etc.; five years' experience in the oil burning industry. Salary and expenses, or commission basis with drawing account. **390.**

Sales Manager or industrial gas engineer for Latin American property. Specialist in commercial and industrial installations, refrigeration, large water heating, large volume cooking. Speaks English and Spanish fluently. Fifteen years' managing personnel of various nationalities. **391.**

Fuel engineer (M.S.) eight years' experience in industrial field, familiar with any kind of fuel and its application, desires position as manager of Industrial Department or responsible position with equipment manufacturer. Good organizer with strong background of diversified industrial research. Married and now employed. **392.**

Manager-Superintendent, experienced in construction and operation of coal gas, water gas, and coke-oven plants. Also familiar with distribution problems. Employed at present by holding company as Assistant District Manager. Graduate engineer with background of practical experience. Best of references. **393.**

Over twenty years' training and experience with one public utility company in all angles of the gas industry; have been constructing and operating **engineer** on plant and distribution work, sales manager, advertising and publicity manager and successful at employee and public relations. Possess good health and have the qualities of initiative, versatility, adaptability and promotion of good will; natural talents are executive and managerial; am not shooting at the stars but am desirous of a position of responsibility where experience, judgment and wide range of activity would be of value to employer. **394.**

Operating **Executive,** manufactured and natural gas experience; organization; engineering, sales and rates. Keen on creating new uses to improve volume and load factor of send-out. **395.**

Rate engineer; engineering graduate with accounting training and several years' experience in rate work, covering rates for manufactured, by-product and natural gas service with Public Service Commission. Thoroughly experienced in making budgets, cost analyses, rate studies, designing rates and similar work. **396.**

Engineer-Manager, experienced in all branches of gas operations, construction, production, distribution, high- and low-pressure coal or water gas, management of plant up to 20,000 meters or chain of small plants, available on short notice, good record. **397.**

Gas Engineer, technically educated and having over 20 years' practical experience in the gas business, is open for any position where an exceptional knowledge of the design, construction and operation of both manufactured and natural gas properties is required. Experience includes transmission, distribution and utilization. Have exceptional record for getting results by the application of sound experience. **398.**

Executive of proven ability with 17 years' experience in all phases of natural gas business desires position in executive capacity with property in stages of construction or in operation. Can give satisfactory references. **399.**

Young practical **engineer** to assist in the manufacturing of gas appliances and act as factory representative. New England territory desired. **400.**

Superintendent with 23 years' practical experience in the production and distribution of manufactured gas desires position with managerial responsibility in small property. **401.**

POSITIONS OPEN

Working superintendent experienced in production and distribution of coal gas; give age, references, salary wanted and when available. **0189.**

Industrial gas **salesman,** experienced and qualified on house heating work and application of gas heating to all forms of manufacturing. Salary in the neighborhood of $3,000 per year, location central East. **0190.**

Gas Superintendent, experienced in water gas manufacture to have charge of manufacture and distribution; plant manufacturing one and one-half million per day; must understand manufacture and high- and low-pressure distribution thoroughly and be a general all around gas man capable of meeting the public as well. Salary to start $3,600 per year. **0191.**

Gas Engineer thoroughly grounded in coal and water gas operating, capable of designing coal and water gas plants up to two million cubic feet per day; familiar with high- and low-pressure distribution and with some knowledge of natural gas. Will be employed in the Engineering Department of a large utility under a Chief Engineer, and associated with a large group of electrical, mechanical, and civil engineers. Salary to start $3,600 per year. **0192.**

Experienced **natural gas** man from the practical field end, preferably with some experience as geologist, for well examination, lease and title work, as well as estimates and predictions as to various field possibilities. Salary $5,000 and up according to qualifications and experience. **0197.**

Young **graduate** in physics, of recognized university, with considerable training in sound and acoustics for research work. Salary to start about $150 per month. **0200.**

Superintendent competent to operate an oil gas plant (for Mexico). Send full details of training and experience. Knowledge of Latin language desirable but not necessarily essential. **0201.**

Assistant Superintendent of large gas plant. Age between 27 and 35. Should have had at least five years' operating experience in gas manufacturing. Please state age, education, experience, and salary desired. **0202.**

Assistant sales manager wanted by gas boiler manufacturer. State qualifications, age, salary desired and when available. **0203.**

Active and aggressive man with initiative, for rapid development into **district manager;** must have technical education, at least five years' experience in water gas production and distribution but preferably ten. Salary about $4,000 to start. **0204.**

Experienced gas appliance **salesman** for small manufactured gas plant in East. Salary $75 per month and 10% commission. **0205.**

Industrial gas engineer seeking a change and interested in location offering good opportunity for advancement may communicate confidentially with **0206.**

PERSONNEL SERVICE

The attention of company executives is invited to the Personnel Service A. G. A. Headquarters is prepared to render by means of (1) the advertisements under *Services Offered* or *Positions Open* and (2) personal records carefully classified for convenient inspection.

Mail copy for receipt by the seventh of the month to insure insertion in the next issue.

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Vice-Chairman	I. K. PECK	Chicago, Ill.
Secretary	H. W. HARTMAN	New York, N. Y.
Asst. Secretary	K. H. CREE	New York, N. Y.

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